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RURAL STUDIES

BOOK ONE

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RURAL STUDIES

BOOK ONE

by

J. C. W. HOUGHTON, B.A.

Lecturer at the City of Leeds Training College

Illustrated with photographs,
and line drawings by
ARNOLD BOND

With thanks to those
who first found
'The Fields' and 'The Wood'

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Book I

PREFACE

THIS is the first book of a four-year course in rural studies. The theme of the course is perhaps best expressed in the words of an old countryman for whom a few hours in the city proved more than enough: 'Let 's get back to the fields where there 's life!'

Emphasis is laid throughout on a direct approach to the activities of country people and the materials they handle in their daily round. Although the course does provide a good foundation in rural studies for those pupils who wish to proceed further with their education in some branch of rural technology, the subject-matter has been chosen and presented with a view to its educational rather than its instructional value. Vocational training is more properly the province of the farm institute, and the method of observation and interpretation adopted in these books aims rather at a widening of interest and sharpening of inquiry.

Each book contains enough material for one lesson per week throughout the school year; and the topics are arranged to correspond with seasonal activities, the more formal classroom work being confined to the winter months when work in the fields is at its slackest. Where experiments and demonstrations are described, apparatus of the simplest kind has been suggested. It was necessary to bear in mind that some schools—not being in possession of flasks, beakers, and so on—would need to make use of improvised apparatus; and the materials described have proved to be both convenient and effective.

Many of the exercises are graded to provide practice in written expression, and have been designed for use in the English lesson. Should it be possible for all the exercises to be done in one book —which could, perhaps, be called 'My Country Book' —each year's work might well comprise a quite desirable record of inquiry and achievement; and the work resulting from the pupil's own observations would constitute a simple but valuable environmental study.

I am grateful to Mr. H. W. Marsh of J. M. Dent & Sons Ltd. for his valuable suggestions concerning various parts of the text, and to the Oxford University Press for their kindness in allowing me to quote two passages from *Lark Rise to Candleford* by Flora Thompson. Thanks are also extended to Mr. Arnold Bond, who has taken so much care over the drawings in this book. I am also indebted to the following who have kindly provided photographic illustrations: Mr. H. Smith, Westcliff-on-Sea (pages 10, 14, 94, 99, 134, 140, and 143); Mr. Reece Winstone, Bristol (pages 27, 44, 72, and 141); *The Farmer and Stockbreeder*, Dorset House, S.E.1 (pages 40, 42, 46, 47, 49, 70, 98, 100, 122, and 127); Mr. G. G. Garland, Petworth (page 84); Mr. D. W. Gardner (pages 4 and 104); and Mr. John Warham, Retford (page 15).

J. C. W. HOUGHTON.

MARSH GREEN
ELWORTH
SANDBACH, CHESHIRE

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I

The Fields in Autumn

> For his bounty,
> There was no winter in 't; an autumn 'twas
> That grew the more by reaping; . . .
> *Antony and Cleopatra* (SHAKESPEARE).

IF WE take a walk through the fields in autumn we are sure to enjoy the lovely colours with which nature has painted the landscape. The woods and hedgerows are hung with leaves and fruits of every hue and, if the day is sunny and still, it will seem to us that nature has already begun to settle down for her winter sleep. Some plants, especially things like daisies and grass, will go on growing a little even until Christmas, but the busy season for most of the trees and bushes and smaller plants is over. Perhaps you did not think that growing plants ever looked very busy? Even in the spring and summer? But they were. All through the hours of daylight the green leaves were hard at work taking in food; and all the plants that make our country so green were busy growing new parts, and—most important of all,

Fruit of the woody nightshade or bittersweet.

perhaps—storing food in one way or another so that when the spring comes again next year they will be able to grow new leaves ready for the summer sunshine. Some of this food is stored in the hedgerow fruits that are often so beautiful—such as the lovely berries of the guelder rose and the soft fruits of the hawthorn and wild rose; and some is stored in other parts of the plant—chiefly in the roots and stems beneath the soil.

STUBBLE CLEANING AND PLOUGHING

Although nature has almost finished her preparations for the winter we shall notice as we go about the fields that the farmer is still very busy indeed. There are still some crops to be got in, and it is likely also that you will see him hard at work even on those fields from which the corn has been harvested. He too must look ahead; and everything he is doing now is intended to give him good crops next year.

Can you name one of the most troublesome enemies that the farmer has to deal with? He has to fight many a battle against pests of one sort or another—pests that spoil his crops—and his work is not very easy. Perhaps you will be thinking of rabbits that nibble his young corn, or of wood-pigeons that take his seed in the spring, or even of young boys that walk on his growing crops! But I am not thinking of any of these at the moment. I am thinking of weeds. What do we mean by weeds? Just this—they are plants that grow very freely where they are not wanted; and he is either a very good farmer, or a very lucky one, whose soil does not contain many weed seeds. Even the best farmer, however, has to keep waging war on weeds, so that whenever he gets a chance he sets about destroying them: and that is one of the things you may well see him doing in the autumn. As soon as the corn has been carted from the fields he goes over the stubble with some implement such as a cultivator, and loosens the soil in *order to make the weeds grow*! But, you see, they are doing no damage at this time as there is no crop for them to rob or smother. He has to be very careful, however, not to let this crop of weeds go on growing until they drop any seeds. That would make things worse than ever. As soon as they are well grown, but before they come into flower, he comes along with his ploughing tackle and

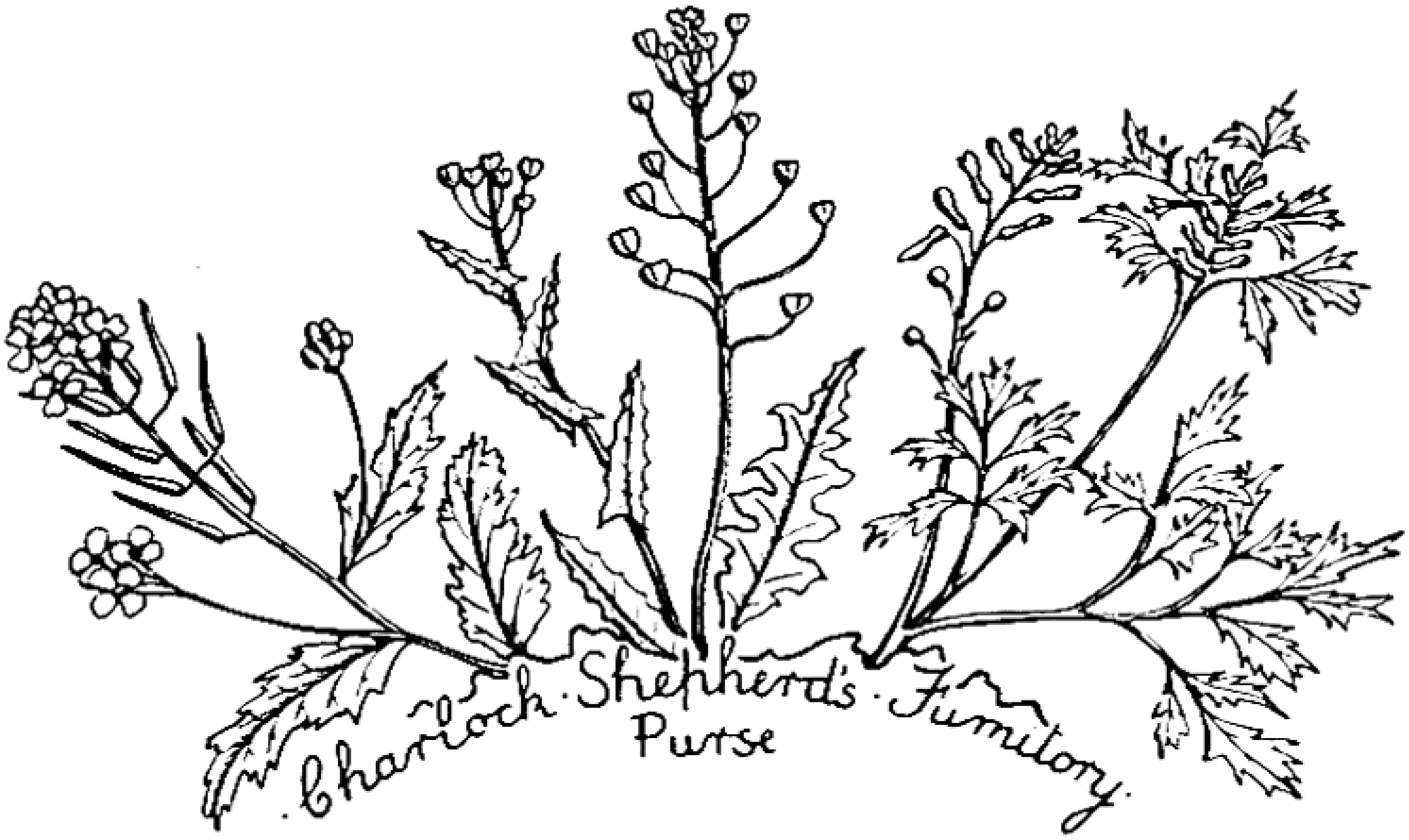
Autumn scene. Can you find five signs of autumn?

ploughs the field. This buries the weeds and kills them. You see this is really a way of destroying the seeds that were in the soil, and if this operation is done correctly the soil will contain fewer weed seeds than it did before—it will be 'cleaner' land, and will not grow so many weeds next spring. This very cunning operation is known as stubble cleaning, and is often employed by good farmers. You should try to find a field where it is being done, and make a collection of the weeds you find growing there. Here are the names of some that you may find:

This farmer in Northern Ireland is ploughing a field of stubble. Notice the rope traces with which he guides his horses.

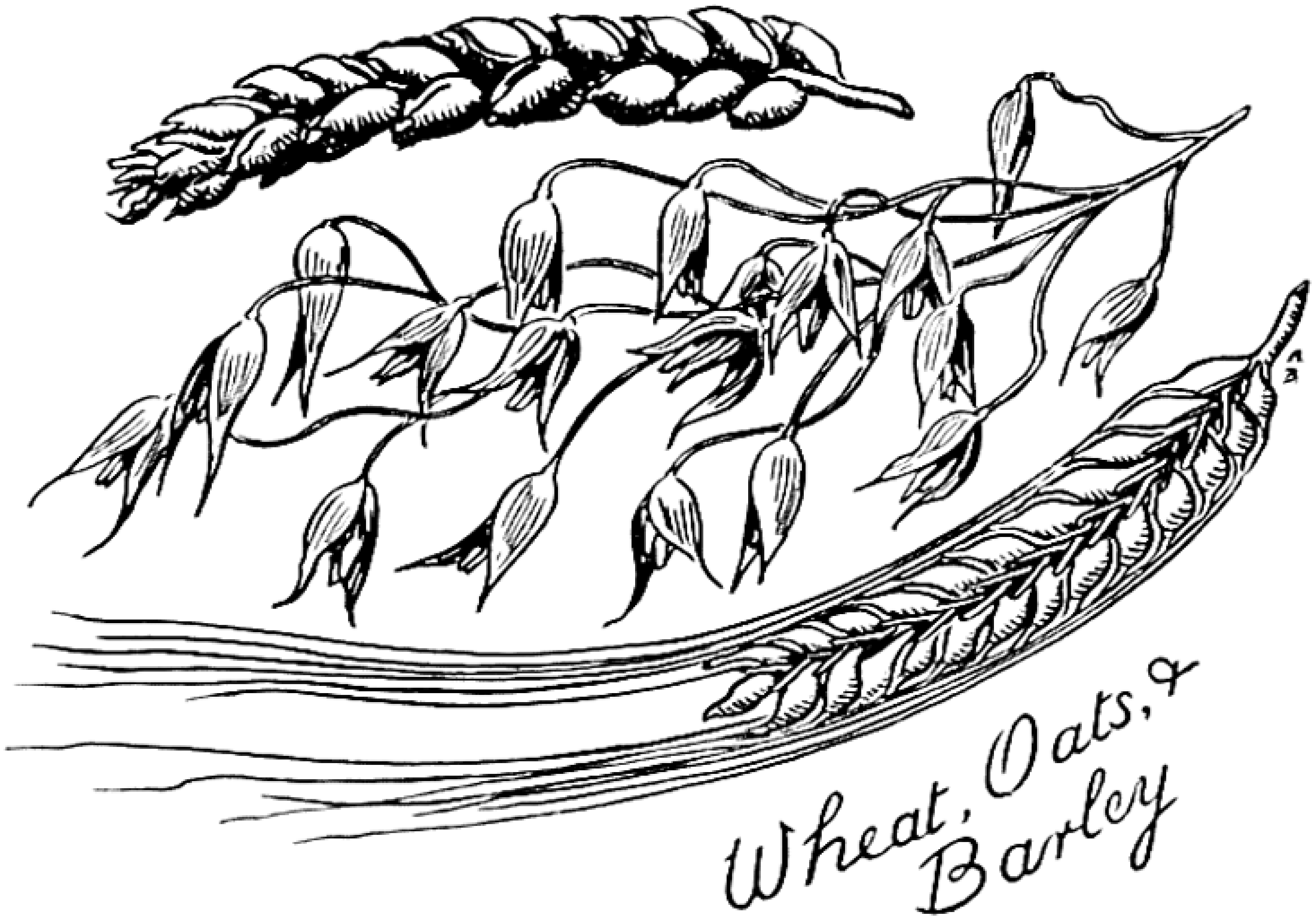
- Charlock
- Chickweed
- Cleavers
- Corn marigold
- Fumitory
- Groundsel
- Mayweed
- Poppy
- Shepherd's purse
- Speedwell
- Wild radish

You will see that these are all *annual* weeds, that is, they grow from seeds each time—unlike plants such as dock and thistle, which go on living under the soil right through the winter, and send up new shoots in the spring without the need for seeds. Can you find the name we give to plants that do this? You must remember that stubble cleaning is useful only for destroying the young weeds that come from seeds.



Three weeds of farmland. Can you say what colour their flowers are?

It may be that the farmer you know will not do any stubble cleaning this year, but in any case he will most probably be ploughing up a number of his fields. Why does the farmer plough? The answer is that it is the first step in making a seed-bed. Whatever is growing on top—either weeds or grass turf—has to be buried, and the plough also lifts and opens the soil so that it can crumble and make a nice fine tilth in which the seeds can be sown. Usually he wants to sow some seeds in the early autumn, especially the seeds of winter wheat and winter barley and winter oats. If you find him ploughing in September you can be fairly sure that he is going to sow some kind of winter corn in those fields. When he brings his plough up to the hedge where you are standing, ask him what crop he is going to sow. Farmers are usually glad to find that you are interested in their work. Some of his fields will not be ploughed until much later on in the autumn—as late as December maybe—and these will be left to the kindly action of the weather, and will not receive any seeds until the spring. So you see, if you watch carefully, you can very often guess what the farmer is going to do. It is rather like being a detective. Do not forget the two main reasons for ploughing. And do not forget either that when the farmer begins to plough he is really beginning to provide you with next year's milk and



This drawing shows you ears of wheat, oats, and barley. Can you say what each kind of grain is used for? What other kind of grain is grown in parts of Britain?

bacon and eggs and bread because the corn that he sows now is necessary for these things. Can you work out which of the corn crops will help to produce the various types of food that I have just mentioned? Write it out like this:

1. Wheat helps to produce —— and —— because . . .
2. Oats help to produce —— and —— because . . .
3. Barley helps to produce —— because . . .

HARVESTING THE ROOTS AND POTATOES

Many of the farmer's crops grow beneath the soil, sometimes right underneath like potatoes, and sometimes partly underneath like the *root crops*, e.g. turnips, swedes, mangolds (or mangels), and sugar-beet. Such crops, together with kale—a sort of tall cabbage—cannot be harvested until the autumn because they are not ready; so that you are very likely to see the farmer hard at work gathering root crops while you are on your autumn rambles. It is strange to think that a field of sugar-beet produces the sugar that makes our sweets and jam; but it is nevertheless true. Some of our sugar still comes from overseas, but much of our ration comes from English farms. When you stir the sugar in your tea or eat your sweet ration remember where the sugar probably came from. The sugar-beet and potatoes are grown for human food, but the swedes, turnips, and mangolds, together with kale, are used as stock food—largely for cattle and sheep. (Although the farmer often finds it convenient to refer to his potatoes as a root crop, the potato is not really a root: it is a swollen stem.) With the exception of kale, these roots can be stored in clamps and fed to the stock at any time during the winter. Kale as a rule is cut as it is wanted, and fed fresh to the cows, but the turnips, swedes, and mangolds are usually lifted about November, and stored in buildings or in clamps so that they can be used when needed. Roots are very expensive crops to grow because they require so much work both when they are growing and also at harvest time, but they have two very special advantages that you must try to remember. One is that the roots produce a greater amount of food from one acre than any other crop, and the second is that they give the cattle and sheep something pleasant and juicy to eat in the winter when there is no fresh grass for them.

Some juicy plants that will make a tasty meal for the cows and sheep when winter comes.

This is important: you know how much more you enjoy your food when there is something nice and tasty for a change!

When potatoes are being lifted the job is usually done with a machine called a spinner, which has a revolving wheel at the back. This wheel has spikes or claws on it, and as the machine goes along the ridges, these claws dig the potatoes up and fling them on to the top of the soil, where they are gathered by pickers. Perhaps you have done some picking? It is a back-aching job! One of the reasons for having potatoes in ridges is so that they can be harvested in this way. After being lifted the potatoes are stored in a clamp or what some farmers call a 'hog.' No doubt you will see this being done if you keep your eyes open. All the potatoes are put into a long shallow trench, and they are piled up in the shape of a long pyramid. They are covered with about six inches of straw to keep out the frost, and this straw blanket is then covered with soil to keep out the wet. Two or three straw chimneys are allowed to stick out of the top of the clamp to let out moisture and prevent the potatoes from 'sweating.' This is a term used by farmers to describe what happens to potatoes if they have no ventilation. Can you find out what the farmer does with the dead potato tops or haulms?

If you live in a part of the country where sugar-beet is grown you will be able to see how the roots are lifted. They are long and tapering, and are often lodged firmly in the soil so that, unlike turnips, swedes, and mangolds, they may need to be loosened in the soil before they can be pulled out by hand. This loosening is done by a sort of plough that forces its way underneath the roots. After they are pulled, they are knocked together to remove the clinging soil and the tops are cut off. Then, instead of being clamped like other roots, they are taken to a special factory where the sugar is extracted. The tops are often used as stock food: sometimes they are carted to the farm buildings for feeding to cattle, and sometimes sheep are allowed to eat them in the field.

Long before the frosty days of winter the farmer carts his mangolds and clamps them near the cowshed.

Swedes, turnips, and mangolds are much easier to harvest. They do not lie so deeply in the soil as sugar-beet, and they can be pulled easily by hand. The farmer goes along with a large knife and as he pulls each root from the ground he chops off the leaves. Then the roots are collected into a cart and carried off the field. The clamps used for these big roots are much bigger than potato clamps, but otherwise they are similar. Instead of being made in the fields, however, these clamps are usually made near the farm buildings so that the roots can be got at easily when they are wanted in the winter.

So you see that the farmer has to be very busy indeed in the autumn—much busier than he is in the summer, when all the crops are busy growing and storing food. In the summer nature does the work if the farmer has played his part well; but in the autumn she has finished, and the farmer must get busy again. Not only must he harvest all his corn and roots and so on; he must also begin straight away to prepare for next year's crops. He must always look ahead and have everything ready for nature to do her work when the time comes.

THINGS TO DO

Do the drawings and writing in your Country Book.

(1) Collect and name at least three different kinds of the fruits of wild plants and try to draw them.

(2) Collect and name at least three annual farm weeds that grow in autumn. Put pictures or drawings of them in your Country Book.

(3) Ask the farmer to let you have a few grains of winter oats, barley, and wheat, and sow these in your garden to watch during the winter.

(4) Watch a farmer making a potato clamp, and then describe what you saw. Do not forget to give the height and length of the clamp and to say how many tons of potatoes it contains.

(5) Find out what acreage of the different root crops your

farmer has grown this year, and find out the average weight per acre for each crop.

(6) Write down four human foods and other useful substances (e.g. wool) that come to you from the root crops that are fed to stock.

Write your answers in sentences like this:

(*a*) Turnips and kale help to produce wool because sheep eat them.

(7) Write a paragraph describing what you saw on an autumn walk.

2

Plants have many Children

What wondrous life is this I lead!
Ripe apples drop about my head:
The luscious clusters of the vine
Upon my mouth do crush their wine.
ANDREW MARVELL.

SOONER or later each living thing, whether it is a plant or an animal, must come to the end of its life, and if there were no means of producing new plants and animals there would soon be no life on the earth at all. This is a dreadful thought, but nature herself has seen the danger and so she has arranged for most living things to have babies. That may sound strange to you. You know very well that human mothers have babies, that mares have foals, sheep have lambs, that birds hatch their chicks and nestlings from eggs, and so on; but perhaps you have never thought that plants have baby plants in the same way. It is, however, true that they do. *Every seed is a baby plant*—at least it has the baby plant inside it in much the same way that a bird's egg has a young bird inside it, and if you give the seed a chance the young plant will begin to grow just as baby birds come out of eggs that are kept nice and warm. You see, then, that a grain of wheat contains the baby wheat plant, and a date stone contains the baby palm-tree. You will be able to think of very many other examples for yourself. Where would you find the young babies of the apple-tree or of the dandelion or of the oak-tree?

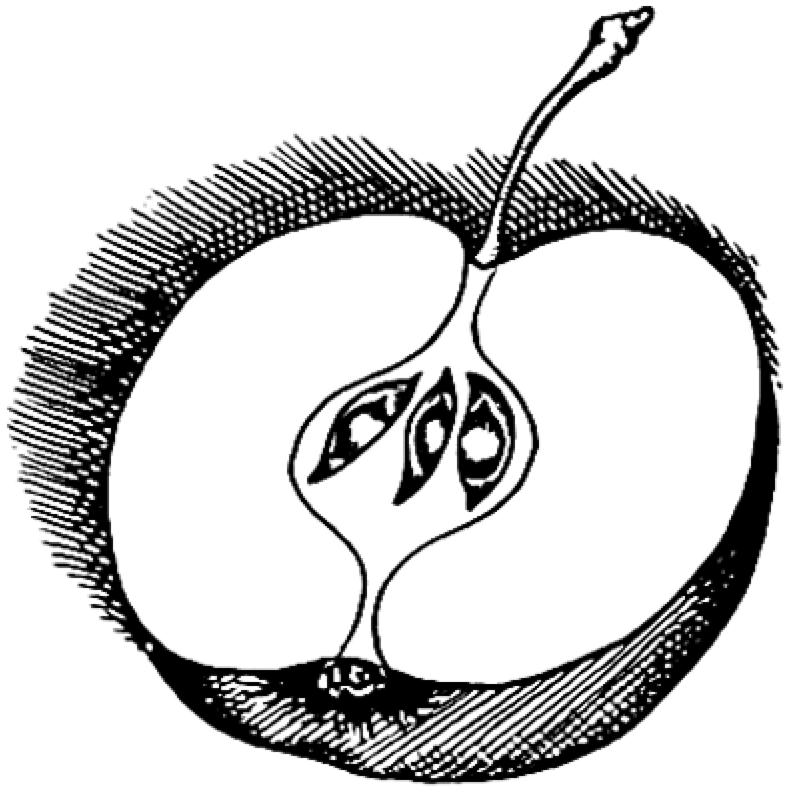
Now young things are, as a rule, very delicate, and need a good deal of protection until they can fend for themselves. Mothers always take great care of their babies: foxes, as you know, conceal their offspring (cubs) in holes made in the ground, and so do hedgehogs and many other wild creatures. Many birds have nests in which to care for their young ones, and human babies, being very delicate indeed, need careful protection in their parents' homes. In the same way nature has arranged all sorts of devices to ensure that the seeds of plants shall have a good chance to grow up strong and healthy like their parents. Very often they are covered with a tough or hard coat. Think of a plum stone! Not many insects could bore

A young foal with its mother. The mare is very contented.

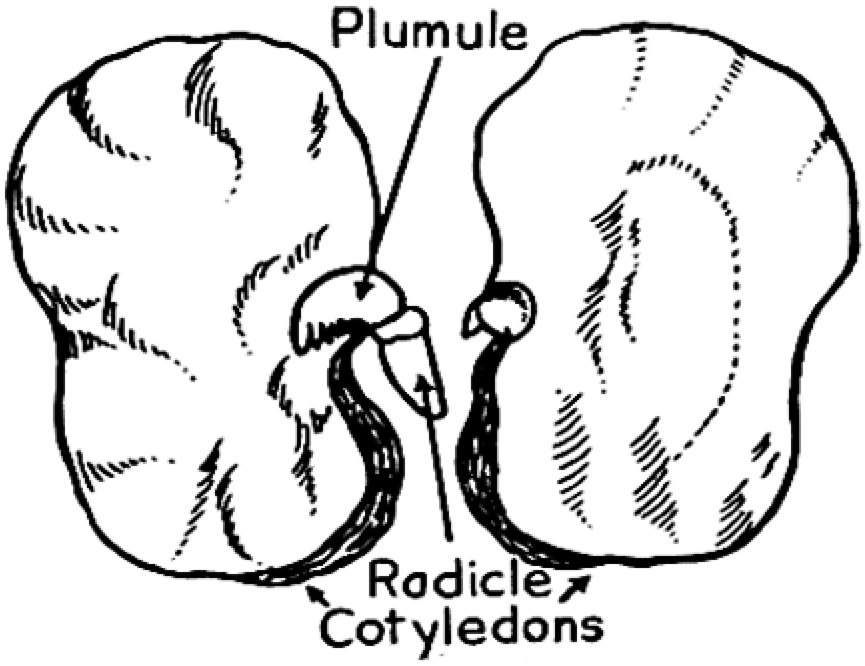
through *that* to eat up the food that nature has placed in the kernel for the baby plum-tree! And have you ever noticed the bean seeds or pea seeds that your father sows in his garden? What a tough jacket they have! It is the same with the apple seeds; they are protected by the hard covering in the core that sometimes gets stuck in your teeth when you are eating an apple.

This nightingale feeds her own babies. They are a hungry family!

This protection is necessary in the case of seeds because most seeds contain a food store for the baby plant to use when it begins to grow. Animal babies are usually fed by their mothers, who either feed them with their own milk or bring food to them as in the case of birds; but baby plants are not looked after by their parents in this way. They have to fend for themselves, and that is why they are given this food store to start off with. The trouble is that many other living things would like to use that food store instead. Think of the large numbers of peas that pigeons will eat or, indeed, think of all the wheat that human beings eat in their bread and cakes and pastry! When you eat such things you are really eating the food that the wheat plant provided for its offspring! No wonder the parent plant tries to protect her precious seeds. Can you think of any other foods that we 'steal' from baby plants in this way—either for ourselves or for farm stock? So many seeds, of course, get lost



Apple pips are baby apple-trees. Notice the core.



The baby bean plant will use up the special food supply in the fleshy cotyledons.

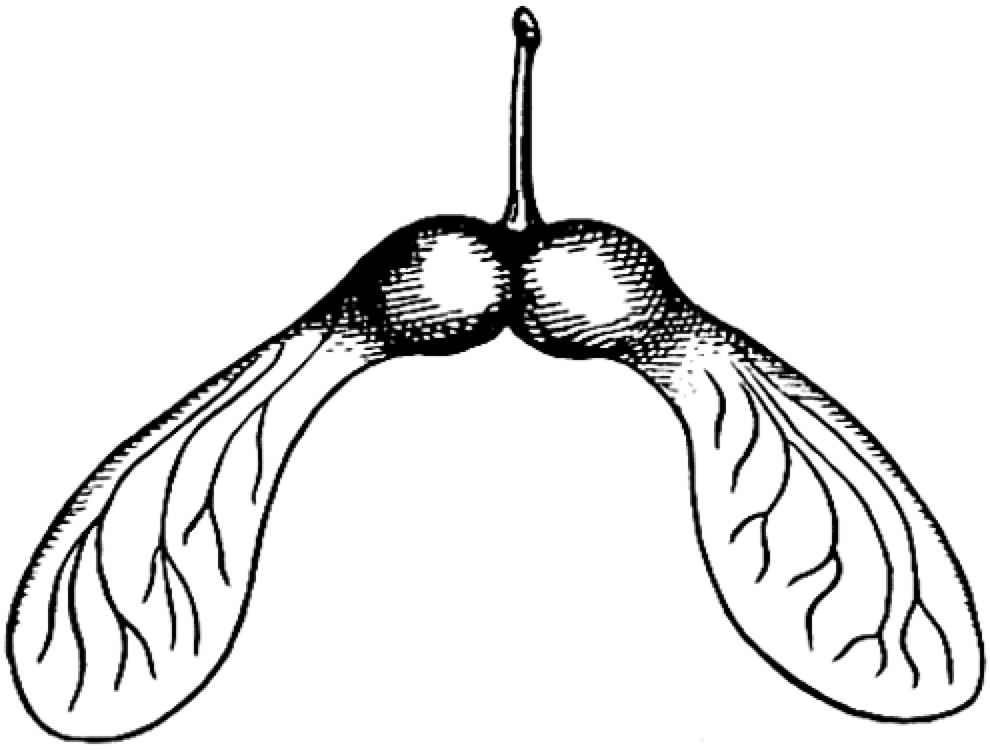
The dandelion produces many seeds.

in this and other ways that all plants produce very many more seeds than are needed. Try counting the number of seeds produced by just one dandelion plant (each little parachute has a one-seeded fruit at the end of it) and you will soon see that they could not possibly all grow. There would soon be far too many dandelions about. However, nature makes sure of some young plants by producing so many seeds—and this is fortunate for us because it enables us to get food by growing things like wheat. The farmer gets twenty or thirty bags of wheat for every bag he sows, and we are able to eat most of this and still leave enough seed for the following year.

SOME AUTUMN FRUITS YOU CAN FIND

The seeds of wild plants are usually to be found in containers of some kind, and you will find it very interesting on your rambles to collect these autumn fruits. When you think of fruits you will think of something juicy and pleasant to eat, but not all wild plants produce juicy fruits. Some, like blackberries, are quite fruity in the ordinary sense, of course, but others are not. The little dry cup of seeds that you find on the stalks of the red campion, for instance, is not juicy, but it is the fruit of that plant nonetheless. Some wild plants, like woody nightshade, for example, grow very attractive-looking berries—beautifully shaped and coloured—but they are quite poisonous so that you must be careful not to eat them. Indeed you should always be quite sure not to eat any hedgerow fruits unless you are sure that they are safe—and not many are.

Many plants produce small colourful berries that are eaten by birds. This is a very cunning device used by nature to have the seeds carried to other places in order to spread the plant about. The seeds are inside the berries and are protected by a hard covering that allows them to pass right through the bird and come out safe and sound in the droppings. The bird gets the benefit of the juicy covering of the fruit, and in return spreads the seeds about. The seeds of such plants as the elder, blackberry, bilberry, hawthorn, and wild rose are carried about in this way. If you watch often enough you are sure to see birds feeding on these fruits. Indeed, if your father grows black currants, you will have seen the birds—especially blackbirds and thrushes—at work on them. Much to your father's disgust, I have no doubt! But we must remember that nature intends the birds to do just this very thing! Wherever you find small coloured fruits hanging along the hedgerows you may be quite sure that those fruits are intended to attract the birds. This is only one of the several ways in which seeds are carried about. Let us look at some of the others.



The winged fruits of the sycamore are spread far and wide by the wind.

There are many seeds and fruits that birds will not bother to eat. How are these spread? Very often the plant depends on the wind. Such fruits as sycamore wings or ash keys are blown about in this way. You should try throwing these winged fruits into the air when there is a breeze blowing and you will be surprised to see how far they go. Young ash and sycamore trees have been found growing in church steeples and on dangerous rocky places. The seeds must have been blown there by the wind. Thistledown, too, is carried about in this way. Each seed is covered with long, fine silken hairs, and the whole fruit floats easily on the lightest breeze, and can be carried for many miles before coming to rest. 'Angels,' these fluffs of thistledown used to be called by country children, and it was fancied that each one was indeed a real angel floating happily over the fields and meadows. You will be able to find many other examples if you search diligently among the wild plants. You have already examined the dandelion parachutes—try also to find those of the rose-bay willowherb. That is a long and beautiful name for a very lovely flower. The pink flowers of this plant are arranged on long tapering spires so that a patch of the rose-bay looks like a fairy city. When it begins to

The rose-bay willowherb is one of our prettiest plants.

fruit the plant is perhaps even more lovely than ever, for the seeds with their long silken threads attached burst from the fruits like foam, and are borne away easily on the slightest breeze.

Sometimes when you are rambling in the country you are sure to come across a plant of burdock. Perhaps you know the name already, for a very pleasant and harmless drink can be made from the leaves of this plant. 'Burdock stout' it is called, and very good it is. The plant gets its name from the 'burs' that it carries. These are really the fruits, and they are covered with tiny hooks so that they stick quite easily to your clothing or to the hair of any passing animal. Here then we have a third example of the way in which nature arranges for seeds to be carried far and wide. She relies on passing animals and hooks her seeds on to their coats. Sooner or later the hooked fruits will drop off again, but by that time the unsuspecting animal is probably far away from the parent plant, and is quite unconscious of having performed so valuable a service. Many other plants have similar fruits. Sometimes when you come home after a long ramble in the fields you will find your stockings covered with tiny green bobs—these are the hooked fruits of the goose-grass, or cleavers, as the plant is called by some people. Try to find these plants, and also try to find and name other plants that have similar hooked fruits.

THINGS TO DO

(*a*) *Written*

(1) Write a short paragraph entitled 'Nature's Babies.'

(2) Describe one of the ways in which the seeds of plants are spread about the countryside.

(3) Write down the names of at least ten different kinds of 'fruit' that grow on farms or in gardens. Remember that anything that contains seed can be called a fruit in our meaning of the word.

(4) Suppose you saw:
 (*a*) A young ash plant growing at the top of some old ruins,
 (*b*) A young sycamore tree growing half-way down a steep cliff face, and
 (*c*) A young blackberry plant growing in a place with no other blackberry plants near to it.

Can you explain clearly how each of these might have got there?

(*b*) *Practical*

(5) Collect and draw:
 (*a*) Two kinds of winged fruit.
 (*b*) Two kinds of coloured juicy fruit.
 (*c*) Two kinds of hooked fruit.

Label each drawing with the name of the plant and say where you found it.

(6) Collect and bring to school for display as many different kinds of wild fruit as you can. (Remember that you may find fruits on even the tiniest of plants.) The whole class should get a total of at least thirty different kinds, and these should be neatly labelled with their names and the places where you found them.

(7) Collect ten different kinds of *seed* from wild plants and place these in neatly labelled packets or small envelopes, such as you use for postage-stamp collecting. Next spring you should choose a suitable spot in the country and sow them. You will then have your own patch of wild flowers to watch from year to year.

3

Autumn Woodlands

. . . A green thought in a green shade.
ANDREW MARVELL.

While all the flowers and trees do close
To weave the garlands of repose.
ANDREW MARVELL.

Under the greenwood tree,
Who loves to lie with me
And turn his merry note
Unto the sweet bird's throat . . .
As You Like It (SHAKESPEARE).

TREES are perhaps the most beautiful plants that grow in our country. Nowadays there are not many big forests, but there are so many trees growing in our fields and along our hedgerows that England sometimes looks like one big woodland: especially to people who come back after visiting a country where there are not many trees. But, even so, there were many more trees in ancient times. It is very probable that the place where your school now stands was in the middle of a great forest in the days when Alfred was King of England, and perhaps a great oak-tree was growing where your desk now stands. In those days the forests were huge and often covered whole counties. You will remember that our first navy was made under King Alfred's instructions, and those ancient ships were made of oak wood from these great forests. And for many centuries most of the homes in which people lived were made largely of the timber that could be got so easily from our woodlands. In Tudor times the houses were made by building a great timber framework—usually of oak—and filling in the spaces with mud or small bricks. These were called half-timbered houses, and many of them are standing to this day. If you can see one near your home you will be able to look at oak beams that were living trees about five hundred years ago, and as those trees would be perhaps five or six hundred years old when they were cut down you will readily understand that some of that timber came from trees that started life over a thousand years ago—long before the Norman Conquest. Try to think of some of the things in history that had not happened when that old beam was a young tree. No wonder we use the term 'hearts of oak' to describe men of courage—like this fine timber, such men are both sturdy and strong.

This half-timbered house was built in Tudor days.

Of course, in those far-off days there were not many people in this country, and not much space was needed to grow food and raise cattle for milk and beef and leather. But as the population grew it became necessary to have more fields, and so the trees began to come down and slowly the forests were cleared away, so that to-day, if any of the people who were living in Alfred's day came back, they would wonder where all the trees were—in spite of the large numbers we still appear to have! Always remember that it takes only a very short time to cut a tree down, but it may take a hundred and fifty years or more to grow another in its place. We should very soon be without much timber in this country if we were to cut down our remaining trees too quickly. Many private people and the government too are planting new trees, but we shall not see the final result in our lifetime. These trees are being planted for those who will come after us. This is very noble work—and very unselfish indeed.

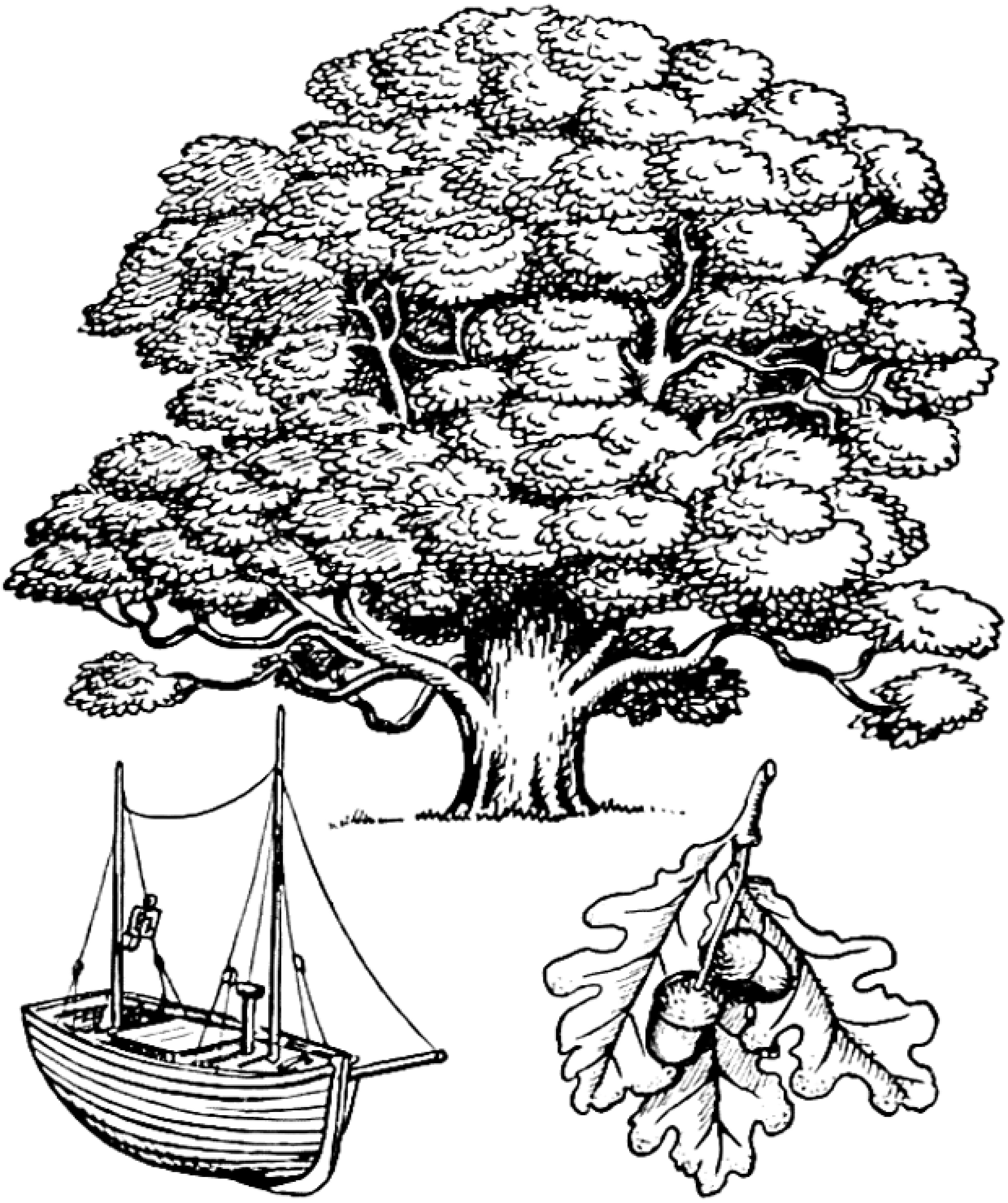
WHERE DID OUR TREES COME FROM?

When the Romans came to Britain they found the countryside covered with the large forests that we have been describing. All those trees had, of course, been planted by nature and none at all by men, whereas most of the trees we see to-day have been planted by our ancestors. What kind of trees did the Romans find? Did they find in Britain the same sorts of trees that we have to-day? The answer is that they found some of them, but not others. You must remember that the Romans lived in this country for several hundred years, and during that very long time they brought a number of trees from Italy and from other parts of Europe and planted them in England. No doubt it made them feel more at home to have some of their own trees growing near them, and no doubt also they admired the beauty of the trees they brought here. It was they that brought the so-called English elm, and also the sweet chestnut. They probably brought the latter in order to grow the nuts for food, but they would be disappointed with the result because, as you know, the nuts do not grow very well in England as a rule. Other trees such as the sycamore, the holly, the horse-chestnut (from which you get your 'conkers') and the lime were brought here in later centuries. It is a little strange to think that boys in Norman times could not play at 'conkers,' or collect holly for Christmas decorations! Nor could they gather the winged fruits of the sycamore and toss them into the air to watch them come

The common elm did not grow in Britain until the Romans came; and we had no horse-chestnut trees for more than a thousand years after that!

spinning down again on the breeze: there were no sycamores in Britain in those days!

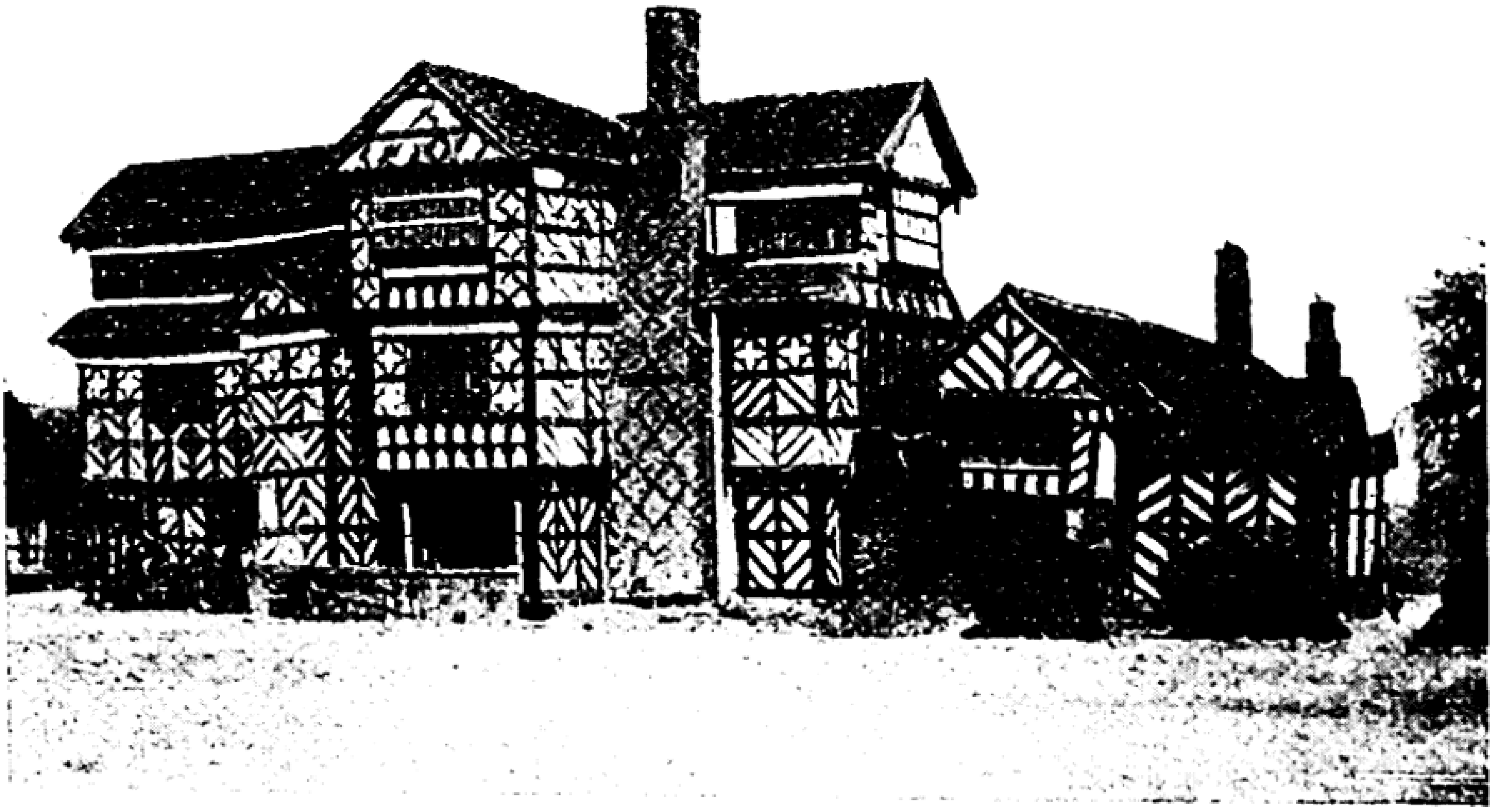
Some of our trees, however, are descendants of the trees that were growing in this country in ancient times. And they are trees of which we are justly proud because they are beautiful. These trees are called 'native' trees, and include the oak, the beech, the ash, and the white willow, from which we make our cricket bats.



The oak is a rugged and enduring tree.

THE OAK

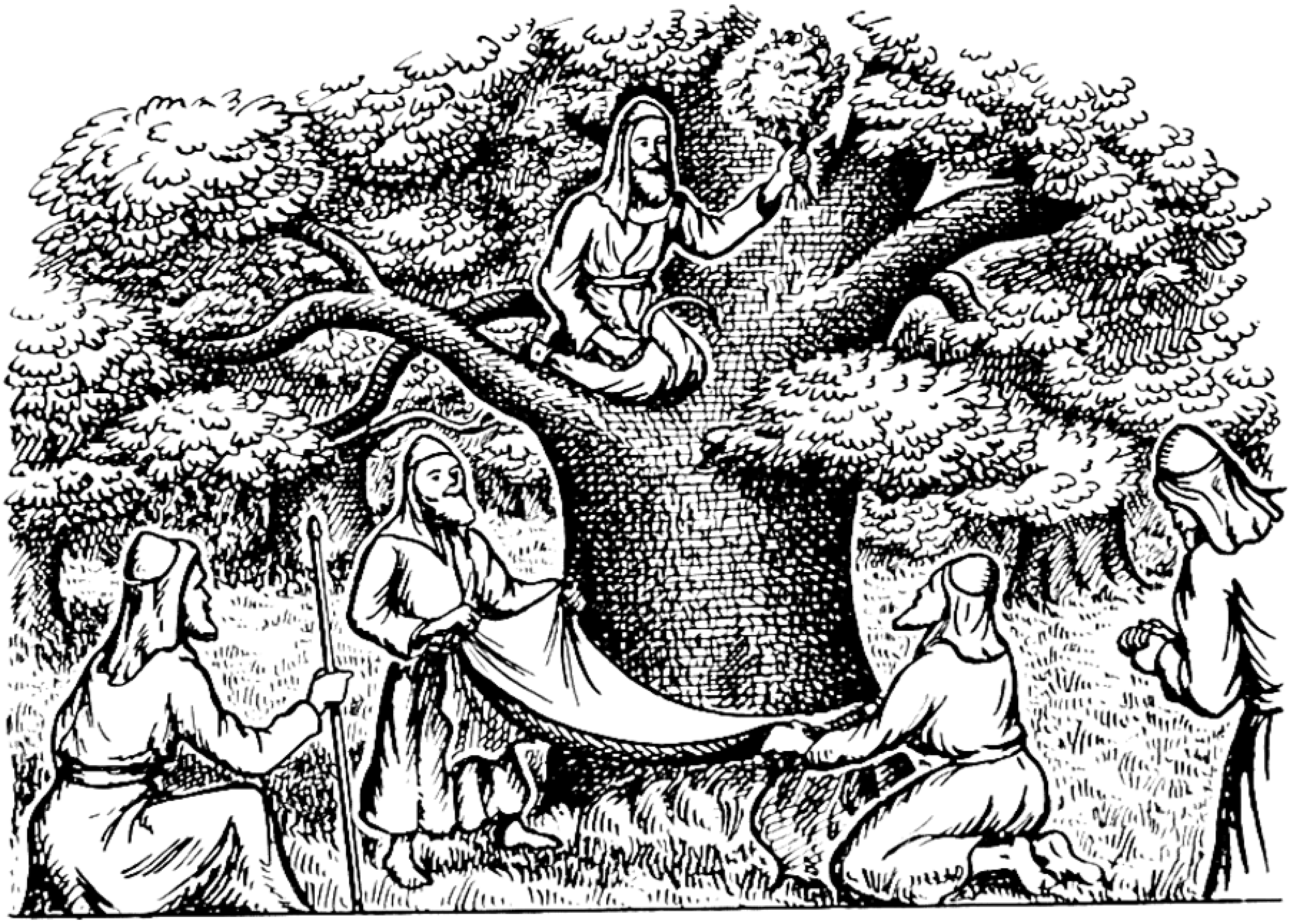
The oak is perhaps the grandest tree of all, and has long been known as the Monarch of the Woods. Its sturdy, furrowed trunk, its rugged branches, its wavy-edged leaves, and its acorns in their cups will be very familiar to you. Very often it is a tree of great age. Indeed it does not even begin to bear acorns (which are, of course, baby trees!) until it is fifty years old. And the timber is of no great use until the tree is at least one hundred and fifty to two hundred years old. Very often, however, oak-trees—especially the big ones you find near to old mansions—are of great antiquity, some of them may be six or seven hundred years old! It must have been an old and rugged tree, dense with leaves, in which Prince Charles was able to hide from his enemies. If you live in the country you will know that this event is commemorated on 29th May—a day known as Royal Oak Day.



Moreton Old Hall was built in the fifteenth century. The timbers of Cheshire oak make an attractive pattern.

In some parts of the country boys and girls wear a sprig of oak on that day. Woe to those that forget, for they are liable to be attacked about the legs by someone carrying a stinging-nettle in memory of the ancient feud.

It is not at all surprising that this tree should have figured so much in our history. The ancient priests of Britain—the Druids—regarded the oak and its wood as holy, and they used to worship their god beneath its branches, and the flames of their sacred fires were fed with oak logs. Very often also criminals were tried under a specially chosen oak, the prisoner being placed in a circle made by the chief Druid's wand, and the judges being seated in a group near the trunk. The Romans too regarded the tree with great reverence:


The Druids worshipped in the woods, and the oak was their holy tree.

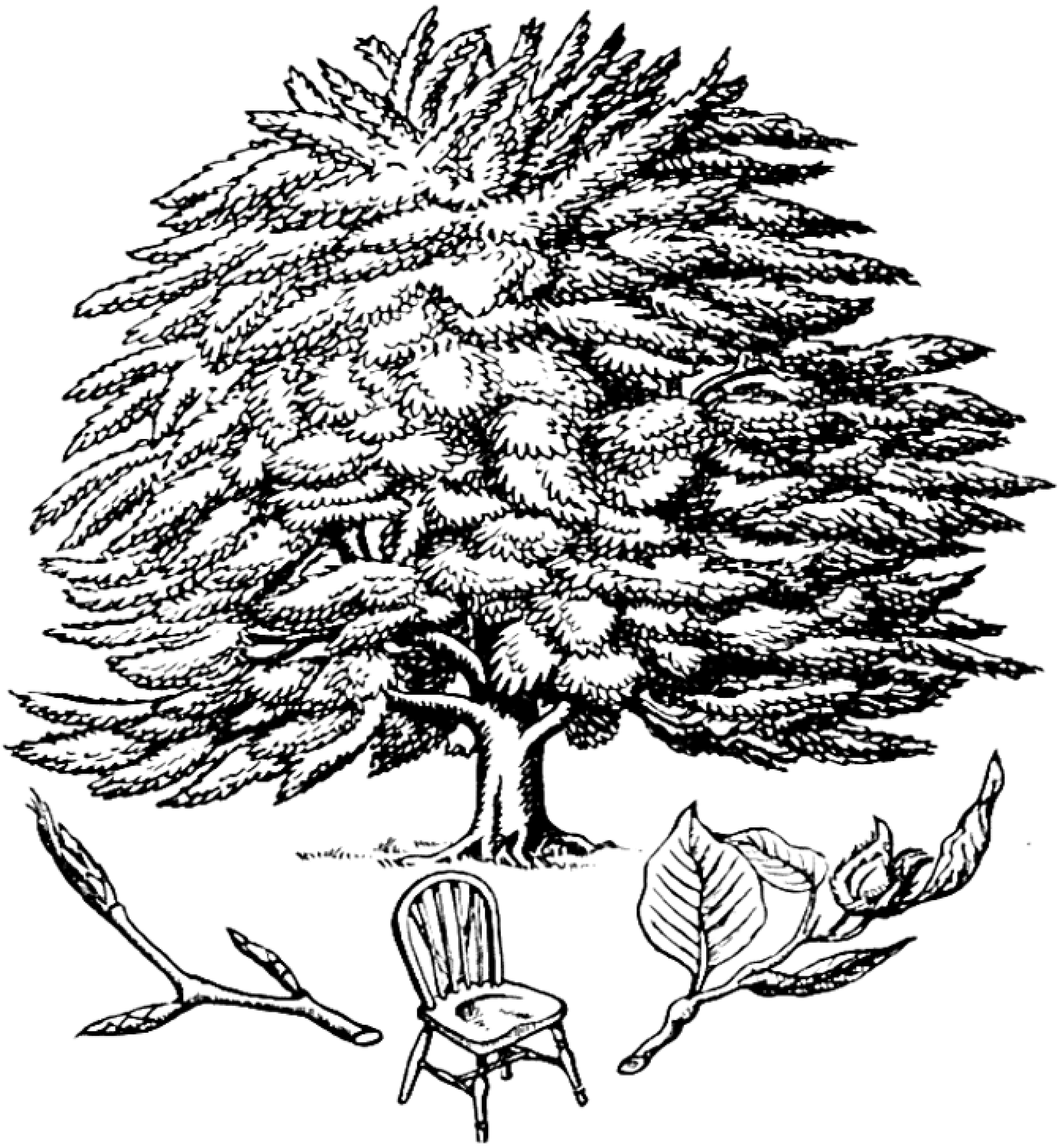
whenever any one in those far-off days saved another person's life he would be honoured by having a wreath of oak leaves placed on his head. In later centuries, when the Romans had all gone back to Italy, the Anglo-Saxons used to hold important councils under the shade of an oak, and it is said that King Arthur's round table was made of the sacred wood, as also was the cradle of Edward II.

Nowadays, of course, the tree is planted for its beauty, for the shade it gives to farm animals on sunny days, and for its timber. The wood of the oak-tree is the most valuable of all English timbers, and a well-grown tree is worth several hundred pounds. It is used to make furniture, and also for boat-building, bridge-building, barrel-making, for the spokes of cart-wheels—indeed, for anything that needs to be tough and hard wearing. In bygone days the bark too was very important as it was used for tanning leather. A brown solution was made by soaking the bark in water and then the skins of animals were placed in this. The brown tannin from the bark makes the leather tougher and fit for hard wear. Nowadays, however, chemicals are used in the tanning process, though oak bark is still used for some thick leathers. Next time you see an oak—perhaps you will be climbing one?—remind yourself of some of the interesting things you have learnt about this tree.

THE BEECH

The beech is another native British tree, and it is interesting to note that it used to be called 'buck' in this country, and it is from this name that we have our word 'book'—because in olden days, before we had paper in Europe, books were made by engraving tablets of beech wood.

Can you recognize a beech-tree when you see one? In summer and in winter? It is quite easy really.



The leafy branches of the beech-tree look like great plumes. What do the three small drawings represent?

The first thing to look for in a well-grown tree is the tall stately trunk, smooth and grey, running like a shaft up through the branches. As a rule the branches are long and tapering and, unlike the limbs of the oak, they are not bent and rugged. The thinnest branches of all, near the outside of the tree, are like long whips, and usually bend gracefully towards the ground. In summer the leaves make these outer branches look something like great feathers or plumes, and it is perhaps because of this that the tree is often known as the Mother of Forests. You should be able to spot a beech-tree even from the distance by remembering about the branches. But this is a matter of practice, and you should lose no opportunity of making a guess.

In the early spring you can easily tell the tree by looking at the buds. These are arranged alternately along the twigs, and each one is like a tiny cigar. You should put a few twigs in water and watch these beautiful buds open: the leaves come out like tiny fans that open slowly, and when they are young these leaves are fringed with silken hairs. The young leaves are a pale green colour, and if you hold one up to the sun you will see that it allows a good deal of light to come through it. Indeed the soft green light under a beech-tree in early spring is something worth seeing and remembering. These leaves are oval in shape, and as they grow older they become thicker and not much of even the strongest sunlight can get through them. This is why the beech-tree casts such a very dense shade on the ground beneath it, and why it is such a valuable tree for giving shade to cattle on a hot day. Try to observe this dense shadow the next time you see a beech standing alone in a field; even when there is no sun shining, the tree casts its shadow on the ground!

You will remember that the oak does not bear fruit (acorns) until it is fifty to sixty years old. The beech, however, gets to work much sooner than that, and the familiar three-cornered beech nuts—or beechmast, as they are sometimes called—are produced when the tree is about forty years old. And whereas the oak is not really mature until it is one hundred and fifty to two hundred years old, the beech is ready for felling at eighty to one hundred and twenty years. So you see our beech-trees are not anything like so aged as our oaks. In the days when there was a good deal more forest land in this country than there is to-day, and before the fields had been enclosed by hedges—in feudal times for example—it was the custom in autumn to turn out all the pigs into the forest where they ate up the fallen acorns and beech nuts. They were looked after by men called *swineherds*, just as men that look after sheep are called *shepherds;* and the swineherd prevented the pigs from getting lost by rambling too far into the forest. Why do we not need swineherds nowadays? Some country people do, of course, collect acorns and beechmast in small quantities to feed to their pigs, and wild animals such as deer, squirrels, and badgers still feed eagerly on these wild fruits.

Beech logs make a roaring fire.

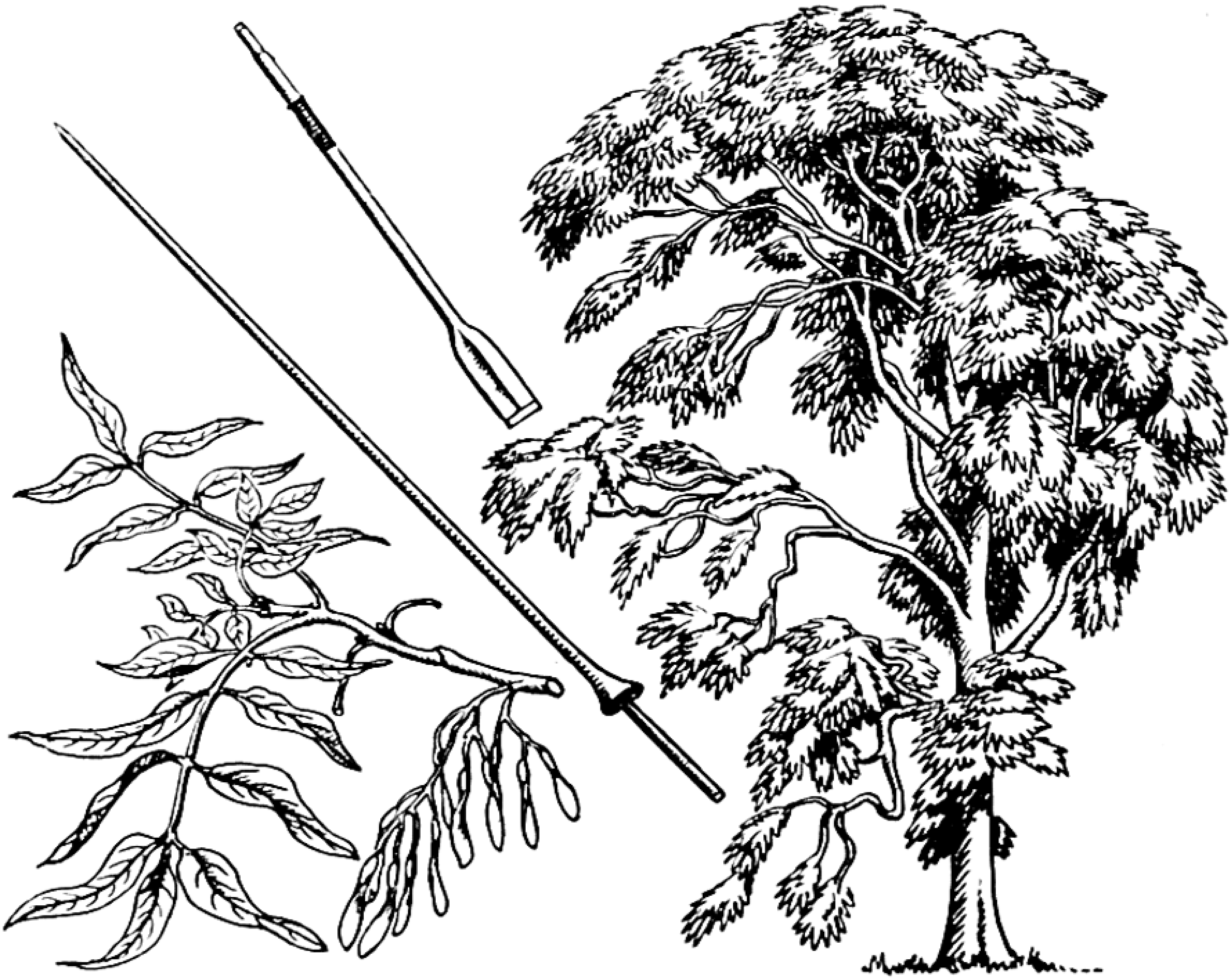
The wood from the beech-tree is not so valuable as oak wood, and you will never find it being used where very great strength is needed as, for example, in bridge-building, or for ladder rungs, and so on. It is, however, used a great deal for making such things as chairs, staircases, and packing cases; and very often things like broom-heads, brush-backs, bobbins, and carpenters' planes are made of beech wood. One of its very good uses is for burning on fires if logs of it can be spared. Some kinds of wood burn very well indeed, others do not. Beech wood is one of the good burners, so next time you are in camp remember this, and use beech logs for your fire. It will be a roarer!

THE ASH

The other large tree in this group of native British trees is the ash. So stately is this tree, and so very beautiful, that it has been called 'Venus of the Woods.' Venus was the name of a very beautiful Roman goddess—the Goddess of Love—so you will see that this name for the ash is one of high praise for its beauty.

There is no likelihood of your confusing it with either the oak or the beech, for it is quite different from either. The trunk is furrowed rather like that of the oak, but is never so dark in colour, and as a rule it is more slender. The outermost twigs almost always turn upwards so that the buds at their tips point skywards. The leaves are very distinctive, and each one carries about six pairs of leaflets with a spare one at the tip. The winter buds too are quite unmistakable as they are large and very black, looking almost as if they had been dipped in soot; and they are arranged in opposite pairs on the thick green twigs.

Sometimes you will find bunches of the so-called 'keys' hanging on a tree. This is the fruit, but unlike acorns and beech nuts, these keys are not eaten by pigs. Each key is a winged fruit, and if you throw one into the air when it is ripe and dry you will see it spin round as it falls slowly to the ground again. Because of this spinning the wind can blow these fruits quite a way, and this is how the tree arranges for the spreading of its seeds. Some ash-trees never have any keys on them because they are male trees. Only the female trees bear fruits—which are really baby trees—and this is just what you would expect. Each beech-tree and each oak-tree is both male and female, so that all beeches and oaks can bear fruit.


The graceful ash provides timber for such things as oars and tennis rackets. Notice the leaves and the winged fruits.

Ash wood is almost as valuable a timber as oak, and for some things it is much more valuable. The wood is usually taken from quite young trees because their timber is mature when they are from thirty to sixty years old. Ash wood is quite tough and elastic, and a long straight shaft of ash will bend without cracking, and will spring back into shape again quite easily. For this reason it was used by the knights of old for making their lances, and bowmen often used ash wood for their bows. Nowadays it is used for making oars, rudders, the rims of cart wheels, axe handles, tennis rackets, billiard cues, and so on. Before aeroplanes were made of metal ash was often used in their construction.

Notice that the three native British trees that we have been learning about all drop their leaves each autumn. Trees that do this are called by the forester 'deciduous trees.' Some trees, like the pine, keep their leaves for five or six years and they are called 'evergreens.' You will learn more about evergreens later on. For the time being make sure you can recognize oak and beech and ash whenever you find them.

THINGS TO DO

(1) Write a short paragraph called 'The Monarch of the Woods.'

(2) Describe an oak-tree that is well known to you. Say something about its appearance, how old you think it is, where it is, how you think it got there, and the kind of person who might well have planted it.

(3) Imagine yourself to be an old oak. Write a story of the things you might have seen or heard about during your lifetime. Start off by saying how old you are. You can write about the dress of the people who may have stood beneath you, etc., and the changes in the view

around you. You will need to write several separate paragraphs.

(4) Pretend you are an old oak beam in an Elizabethan half-timber house. Write your life story. You might let this be your composition for several weeks if you are very interested in the idea.

(5) Write single sentences in answer to the following questions (the answer to the first will start like this: The three most important native British trees are the . . ., the . . ., and the . . .):

  (*a*) Which are the three most important native British trees?

  (*b*) What are three uses to which oak wood is put?

  (*c*) Who planted the forests that were in Britain when the Romans came?

  (*d*) Who planted most of the trees that we have in Britain now?

  (*e*) Why is ash wood used for things like oars, tennis rackets, and axe handles?

(6) Collect the leaves of ten different trees, and make neat labelled drawings of them in your book. Say where you found them.

(7) Collect the twigs of oak, beech, and ash, and make neat labelled drawings of them.

(8) Make a list of all the different kinds of trees, large or small, that grow in your district. You should find about thirty different kinds.

4

From Dairy to Doorstep

> When Molly smiles beneath her cow,
> I feel my heart—I can't tell how.
>
> Old Ballad.

IF YOU had lived at the time of the Armada or even later during the days of the Civil War in England, you would have been able to have plenty of milk to drink during the summer—especially if you had lived in the country—but it is most likely that you would have had none at all from November to May! Nowadays we get almost all our milk from cows (a little goat's milk is used, but not much), but in the days of Queen Elizabeth farmers kept both cows *and sheep* for milking purposes, and winter milk was very scarce because there was very little food to give to the stock in winter months. As you know, modern farmers grow a great deal of cattle food in the summer, and a large proportion of this is stored for use in the winter when there is little grass for the cattle to eat in the fields. Things like clover-hay, mangolds, turnips, swedes, and silage,[1] together with certain rich cattle foods called 'cakes' that come from abroad, are used for feeding modern herds in the winter so that we have a good milk supply all the year round. But formerly there were no such winter fodders and, of course, you can get no milk from your cow if you do not give her food, because she makes her milk from the things she eats. Indeed, so short was the winter food for cattle in those days that many cattle were killed in the autumn of each year, and those that were kept became very lean on the diet of straw and poor hay that was provided. Even in the summer months, when there was plenty of grass, those cows did not give nearly so much milk as a modern cow. They were poor milkers, and gave much less milk a day than we get from our modern breeds. No wonder that sheep's milk had to be used as well. Remember also that both cheese and butter would be scarce in many places because both these foods are made from milk.

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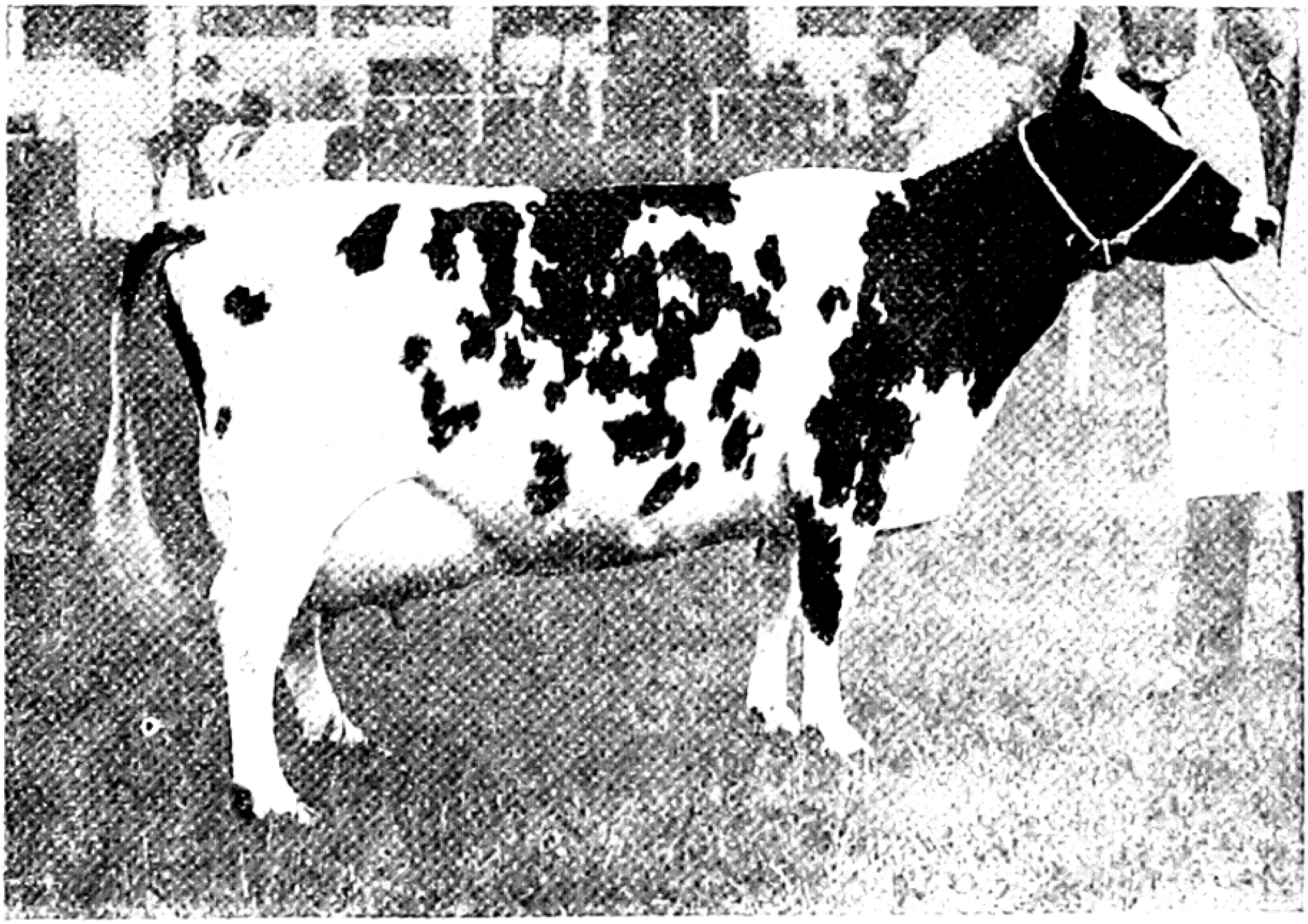
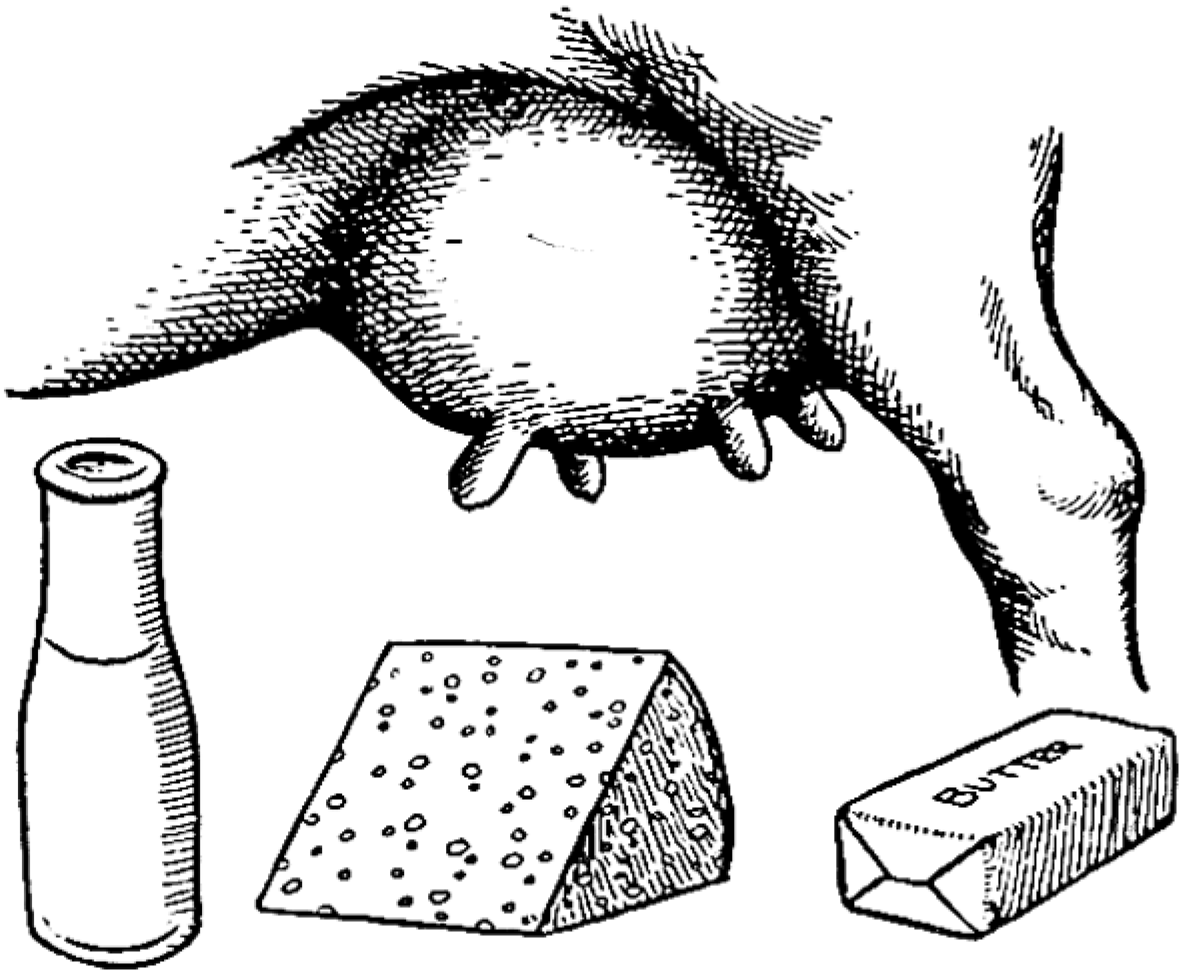
[1] Silage is made from such things as grass and green oats to which molasses—black treacle—has been added.



This modern dairy cow is a prizewinner. Notice the large udder.

We are truly fortunate to be able to obtain these things. Most children in those days got none at all for months on end. Perhaps they were not such 'good old days' after all?



Cheese and butter are made from milk.

HOW WE GOT OUR IMPROVED MILK SUPPLY

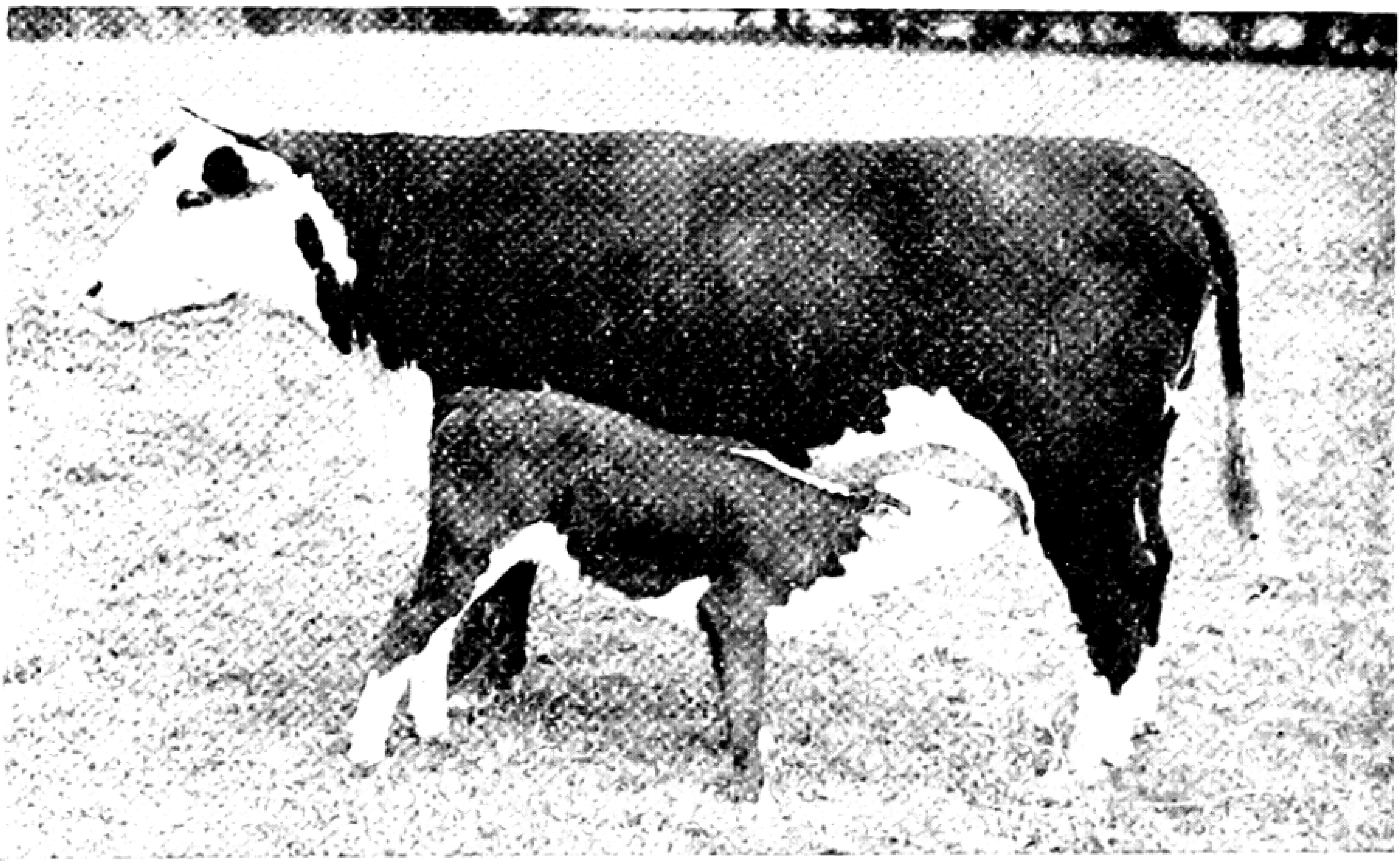
It was not until two or three hundred years ago that a change began to be made. First of all it was necessary to have better foods that could be stored for winter keep. This happened when turnips and red clover began to be grown on a larger scale. Both these crops provided very good cattle food, and both could be stored for use in the winter. Also, at about the same time, two other important improvements began to take place. Some of our more intelligent farmers saw the need for having better cows—cows that would give more milk each day. Where were they to be got? If you had been a farmer in those days you could not have gone to the auctions to buy better cows or bulls because there were none to be had. Nor were there any to be bought in foreign countries. You will find it difficult to understand just what happened, and you will learn more about it later. It is sufficient for you to remember that the change was brought about by careful breeding. Men like Robert Bakewell, who was a farmer and lived between 1729 and 1795, chose the best cows they could find and mated them with the best bulls they could find. After a cow has been mated with a bull a calf is born, and this calf is likely to inherit the good qualities of its parents. Cattle-breeders kept on breeding their cows in this way, selecting only the best animals for their purpose, and, after many generations,

If the dairy bull is a good one, his daughters will be good milkers.

better cows became more and more common, until to-day we have some very good cattle indeed—much bigger than their ancestors, and capable of giving a great deal more milk. Even to-day we are doing the same thing: and our breeds are still improving in quality. Some farmers keep better cows than others, of course, but most farmers go in for good breeds nowadays.

HOW FARMERS GET WINTER MILK

Before we can understand the third important change in the keeping of dairy cattle, we must ask why a cow gives any milk at all. Certain animals, called *mammals*, feed their young ones on milk that is produced by the mother. You will be able to think of many examples of such animals, and the dairy cow is one. We have seen that in order for a calf to be born the cow has to be mated with the bull; and if this mating is successful the cow gives birth to a calf nine months later. As soon as it arrives she is able to provide it with milk, which she produces in her udder, and which the calf is able to get by sucking at one of her four teats. It is in the nature of cattle for this mating with the bull to take place in the summer months, some time in July or August perhaps, so that the calf will be born in the following spring. This has two advantages for the calf. First of all the mother will have plenty of new grass to eat when the calf is born, and this will enable her to make plenty of milk for it, and also the weather is by that time of the year becoming warmer, so that the tiny calf is not likely to catch cold. You see how wonderfully nature arranges these things: all through the cold winter the calf has been warm and safe in its mother's inside, and is not born until the weather is suitable. After the calf is born the cow will go on giving milk until the fall of the year. Of course, the calf is not allowed to have much of this milk because the farmer wishes to sell it. Sometimes the little newcomer is sold, and even if it is kept it is fed on gruel and other substitutes as soon as possible. Do not imagine, however, that the farmer starves his calves in any way! He knows how to feed them well so that they will grow into useful cattle.



Milk is the baby creature's natural food!

You will readily understand that the farmer who wishes some of his cows to produce milk in the winter will have to change the natural order of events: he will have to arrange for the calves to be born in autumn so that their dams will give milk during the winter. He does this by arranging for the matings with the bull to take place in the winter instead of in the summer, so that the calves will be born about October or November. You may think that he should not interfere with nature in this way, but remember that he is able to keep the calves warm by sheltering them in the farm buildings, and he is able also to give the cow plenty of winter food. So that he really makes up for the change of birthday that he has arranged.

These three great improvements, then, have made it possible for us to have more milk in the winter:

(i) The growing of things like turnips and clover for winter use.
(ii) The breeding of better cattle; and
(iii) The mating of cows and bulls so that calves are born in the autumn.

Next time you visit your favourite farm you should think of these three things, and see whether your farmer pays attention to them. I am sure you will find that he does.

MILKING TIME

Care of the Herd. Cows in the dairy herd have to be milked at least twice a day. If the cow is not milked the udder usually becomes very swollen and painful. Sometimes when dairy cows are taken to a show they are left unmilked for longer than usual so that the judges can see from their swollen udders what good milkers they are. This, however, is very cruel, and many good farmers do not allow their cattle to be treated in this way. And in the long run it is better for the farmer to treat his cows well, because they will give more milk if they are properly looked after.

They are very sensitive animals indeed, and know when they are being handled kindly. There is an old country saying that shows us that farmers have always been aware of this. It says:

Grazing in the meadows. These cows are enjoying the springtime grass.

> Them as brings up cattle should be one-legged and dumb.

Can you guess what this means? It is a way of saying that cows do not like to be chased over the fields when they are being 'brought up' for milking. Nor do they like to be shouted at. A good farmer takes great care of his herd; he knows it is best for the cow and for him as well.

In the summer months—usually from April to October—the dairy herd lives in the open fields. On some farms milking utensils are taken to the fields in a movable cowshed called a milking bail. This is a very useful arrangement indeed on large farms where the cattle may be grazing in distant fields. Generally, however, the herd has to be brought to the farm cowsheds at milking time.

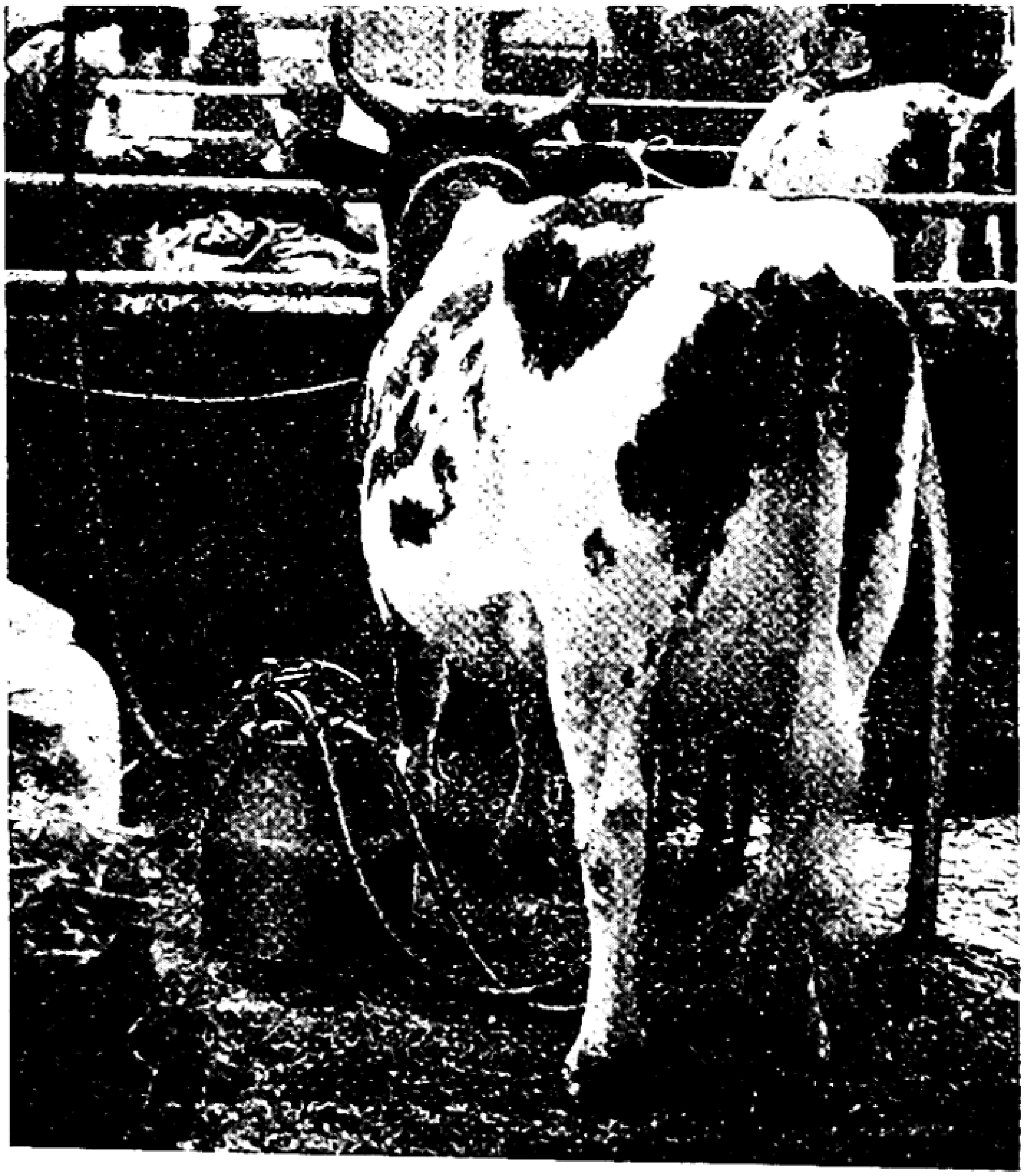
During the winter the cows spend the greater part of their time inside, though they are let out into the fields for a short time each day to give them a little exercise, and also to give the farmer a chance to clean up the shippon and put down some clean straw for bedding.

How the Milk is got. The first milking takes place in the morning, beginning usually at about six or seven o'clock, and the second milking begins at about four o'clock in the afternoon. As a rule it takes about an hour and a half to milk the herd. Many things can go wrong if proper care is not taken so let us see what happens on a good farm.

It is important for the cowshed to be clean. Every day the floor is washed thoroughly with water and the walls are brushed down. This prevents the accumulation of dust and germs, and helps to keep the cows healthy and the milk clean and pure. When all is ready the cows are brought in from the yard. Watch them as they enter and you will see that each one goes to her own accustomed stall and makes a mistake only if she is hurried in any way. The men and women who do the milking on this particular farm are dressed in clean white overalls, and their first job after each cow has been tethered is to wash the udders and teats thoroughly with clean water. This is very important, as otherwise any dirt or germs that may have collected on the udder would most likely get into the milk. Notice also that the hind quarters of each cow have been well groomed to remove any dirt that might have been clinging to the hair. This grooming is done once a day, but never just before milking, as it is a process that makes the air dusty and this dust would get into the milk.

Some cows are milked by hand. It takes an expert to do this job well.

When all is ready the actual milking begins. This is still done by hand on many farms, though milking-machines that work by suction are more common. Hand-milking, if it is properly done, is very much better, but it is more costly, and there are not enough good hand-milkers in the country to milk all our cows now. The trouble with milking-machines is that they very easily collect germs, and are difficult to keep clean so that disease can very easily be carried from one cow to another when the machine is used. The men on the farm that we are visiting wash their hands in disinfectant both before and after milking each cow so that germs are not carried from one beast to another. Of course, if the milker does not keep his



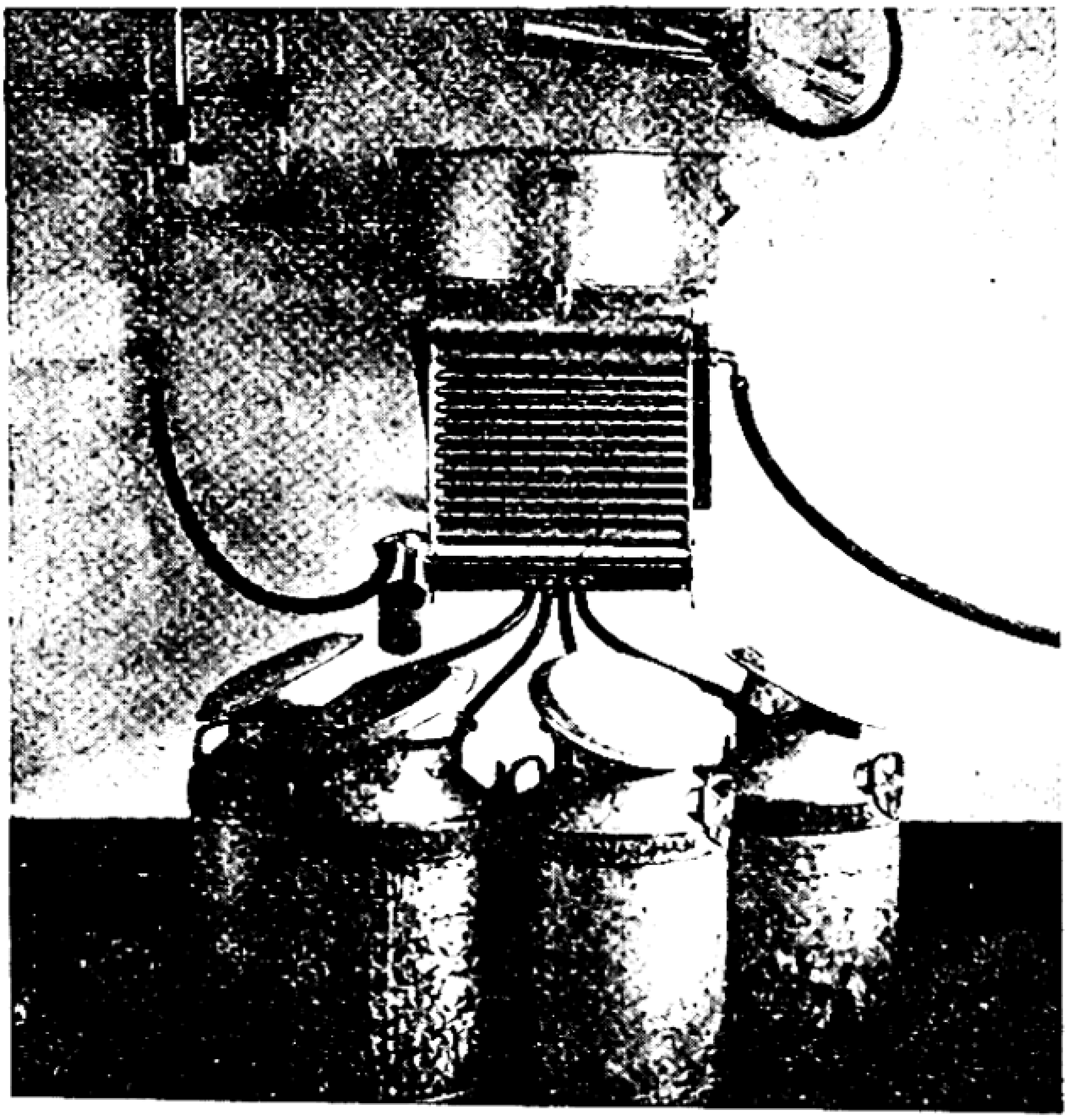
This cow is being milked by machine. Notice the suction cups fitted to her teats, and notice the container into which the milk flows.

hands washed in this way he is as dangerous to the health of the herd as a machine.

All the pails and cans into which the milk goes are kept extremely clean, and as well as being scrubbed with soda and water before use they are put into a steam box to kill any germs that may be in them. You will notice that pails full of milk are never left standing about the cowhouse where germs may collect; but are taken immediately to the dairy where the milk is poured through a cloth strainer to remove any dust that may have got into it. The milk is still quite warm, of course, almost as warm as it was in the cow's udder, and it is important to cool it down quickly.

The Importance of Cool Milk. The germs that cause milk to go sour or those that make it dangerous to our health multiply very rapidly in warm milk, so that the sooner it is cooled the better. Good farmers see to this as soon as the milk is taken from the cow. The cooler—a sort of metal case covered with horizontal ridges—has cold water passing through it all the time. The milk is made to flow in a thin film over the surface of this machine, and this causes rapid cooling, so that any germs in the milk are prevented from increasing their numbers. Provided that the milk is kept quite cool it will not sour easily. You know how quickly your jug of milk at home will turn sour on a hot, thundery day. This is because it gets warm again, and the germs are able to multiply in sufficient numbers to cause souring. Very often your mother boils the milk on such a day. This kills all the germs but, as you know, it spoils the flavour of the milk, and it would be much better to keep it really cool.

After cooling, the milk is put into sterilized bottles, or into large churns, and it is then ready to leave the farm. Most of the milk in Britain is collected by large dairy firms, who come round once a day and take both evening and morning milk at the same time. A large proportion of this milk is sent by rail to the cities, where it is treated to kill germs before being bottled and delivered to the houses of city dwellers on the following morning. Even then it is usually not more than a day old. This is quite remarkable when you remember that some of the milk used in the cities has to be brought over a hundred miles—some of the milk

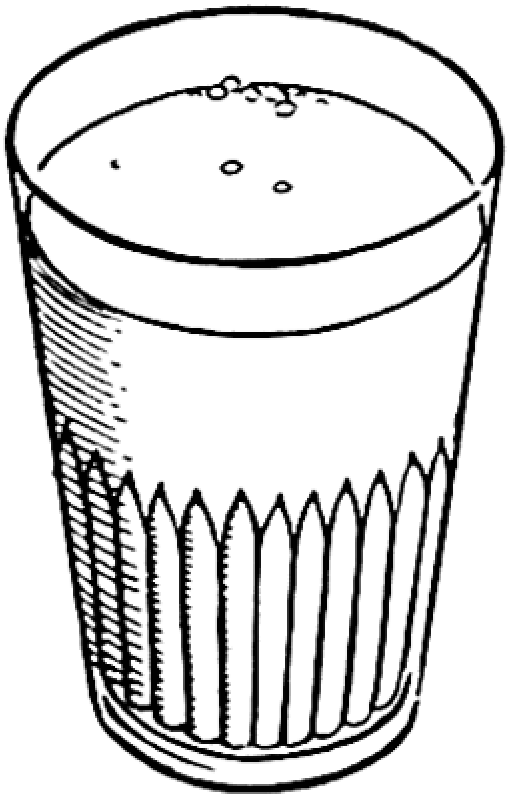


Here you see a milk cooler. The warm milk flows from the vat at the top, over the cold ridges, and into the churns.

used in London comes from as far away as farms in Devonshire! But let us return to the cowshed.

After the milking is finished all the utensils are thoroughly cleaned and sterilized before being put away in readiness for the next milking. If it is summer time the herd will be turned out to the fields again as soon as milking is over, and the cowshed cleaned and washed down. In the winter, however, they will be given the remainder of their rations—such things as hay and turnips and kale—and then they will be let out for exercise and to give time for the cowmen to clear up the litter and dung before putting down some fresh straw.

Remember that this process goes on twice a day for seven days a week, and every day in the year our cows give us about four million gallons of milk. It is not possible for all the farm staff to rest on Saturday or Sunday, as the cows do not know anything about the calendar! The next time you drink your milk or eat anything that has been made with the help of milk, remember all the care and work that were necessary before you could have it. You will be very thankful indeed.



Milk is a nourishing food.

THINGS TO DO

(1) Write a short paragraph about the importance of turnips and clover to the British people.

(2) Write single sentences in answer to the following questions (begin your answers like this: Butter and cheese

were scarce in winter until two hundred years ago because . . .):

- (*a*) Why were butter and cheese scarce—especially in winter—until two hundred years ago?
- (*b*) Why does a cow give milk at all?
- (*c*) Why is it generally necessary to milk cows at least twice a day?
- (*d*) When do you think it might be necessary to milk a cow only once a day?
- (*e*) Why does nature, if left to herself, arrange for calves to be born in the spring of the year?
- (*f*) What is done to dairy cows just before milking begins?
- (*g*) Why is it necessary for a milker to disinfect his hands *after* milking a cow?
- (*h*) Why is milk taken out of the cowshed as soon as it is drawn from the cow?
- (*i*) What is the good effect of cooling newly drawn milk?
- (*j*) Are the cows turned out of their stalls immediately after milking?

(3) Visit your favourite farm and find out the following things:

- (*a*) The number of cows at present 'in milk.'
- (*b*) The average number of gallons per day the herd is giving at present.
- (*c*) The name and age of the cow giving the smallest amount of milk. How many gallons a day is it?
- (*d*) The name and age of the cow giving the most milk. How many gallons a day is it?
- (*e*) The average number of gallons per day the herd gives in the depth of winter.
- (*f*) What is the breed of these cows?

Write down the results of your inquiries in sentence form.

(4) Make a list of the foods your farmer friend intends to give to his cattle this winter.

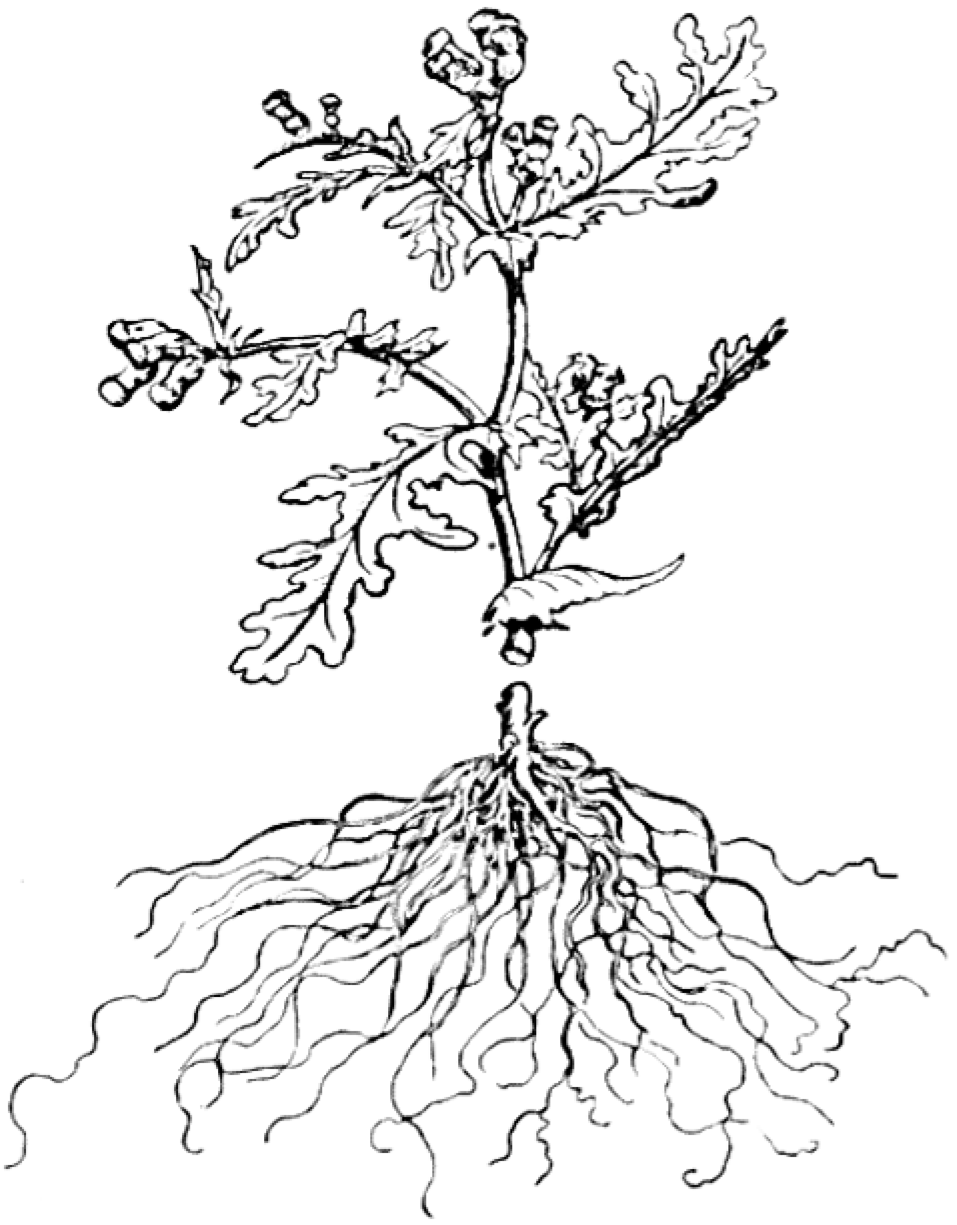
(5) Make a simple, neat drawing of the milking parts of a milking-machine, i.e. the cups and the bucket, showing the tubes. Label each part accurately.

5

The Parts of a Plant

> . . . daffodils,
> That come before the swallow dares, and take
> The winds of March with beauty; violets dim,
> But sweeter than the lids of Juno's eyes.
> *Winter's Tale* (SHAKESPEARE).

JUST as the bodies of animals have different parts to do different jobs—legs for walking, eyes for seeing, lungs for breathing, and so on—so do the majority of the green plants that we see around us. This is true of large trees, as well as tiny wild plants, weeds as well as crops. Each green plant—however big or small, however useful or troublesome to the farmer—is made up of parts each one of which has a special duty to perform, and without any one of which the plant could not go on living properly.

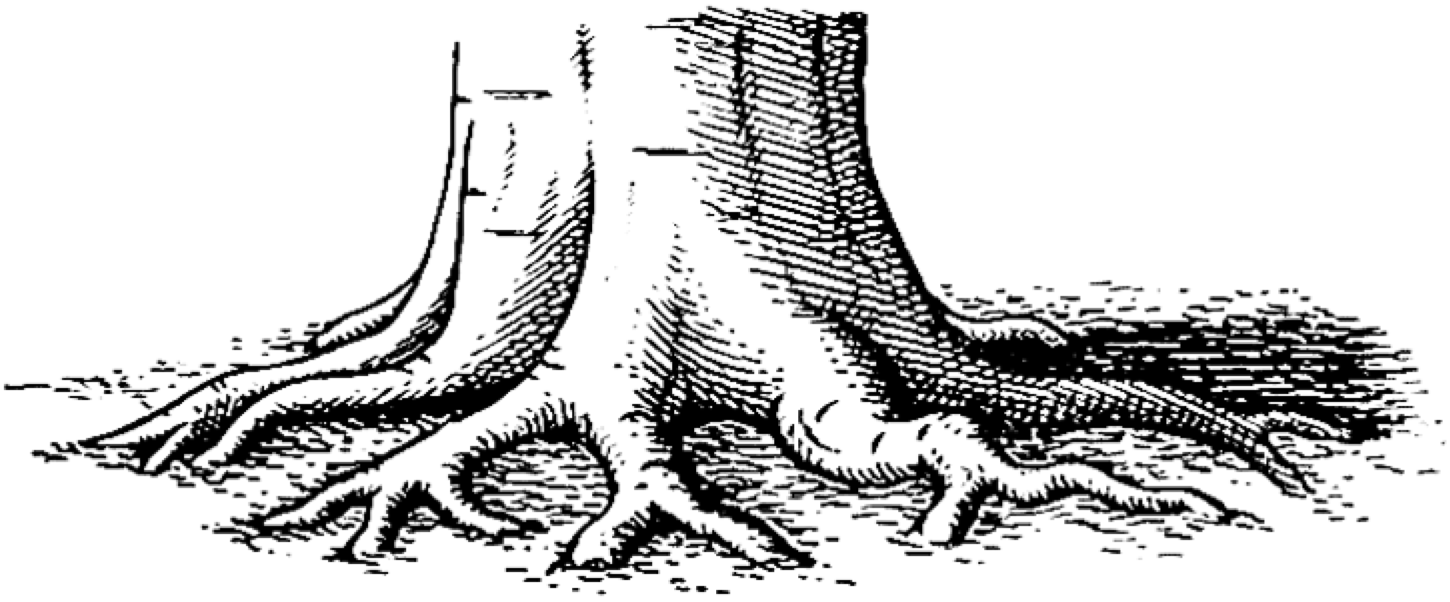


A groundsel plant. Notice the roots, the stem, the leaves, and the flowers.

Let us take a small plant that shows all the parts well, and ask ourselves a few questions about it. Such a weed as chickweed or groundsel will do very well indeed. Choose a well-grown example, and lay it on the desk beside you.

THE ROOT

Let us start at the bottom end where we shall find the roots. Can you guess what these are for? What would happen to a plant that had no roots—a tree, for example? It would, of course, fall over, and it is clear that *one of the important uses of the root is to hold the plant firmly in the soil.* You have to *pull* weeds from the garden because they are held quite firmly by their roots, so firmly that even a gale of wind cannot blow them out of the ground. Think what would happen to trees if they were not securely anchored in the soil by their roots! The slightest wind would blow them down. This does happen sometimes to old trees whose roots are getting rotten. It is not uncommon, after a gale, to find such trees uprooted and sometimes lying across the road, and you no doubt know that the tornadoes that sometimes sweep across parts of America will uproot even the strongest trees. So, you see, it is very important for a plant to be firmly anchored to the soil by its roots. But it is not the only service that roots provide. Can you think of another?



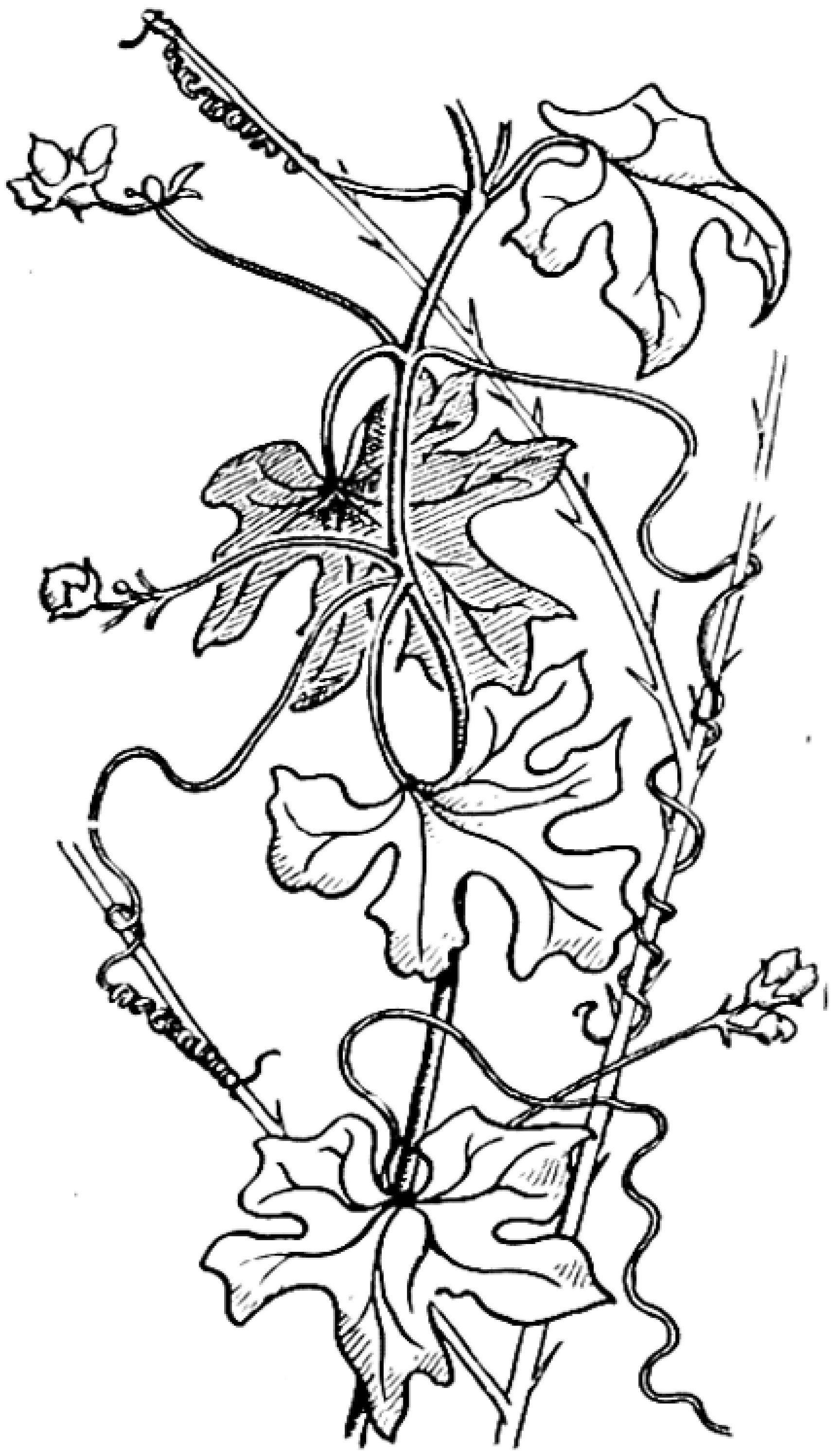
Plants are anchored firmly to the soil by their roots.

Let us think what happens to the bunch of flowers we sometimes pick on our rambles. If it is a hot day, and we have to carry them very far, they begin to droop or wilt, and the first thing we do when we get home is to put them in water so that they will 'pick up' again, as we say. Sometimes even the plants in the garden begin to droop if there has been no rain for a very long time, and then we go along in the evening and water them. It is not necessary to put any of this water on the parts of the plant we can see. Indeed we usually take care to put it on the soil so that it can get to the roots. Here then is the second answer to our question: *another use of the roots is to drink in the large quantities of water that any plant needs.* In case you should think that the root does not soak up very much water I must tell you that an ordinary-sized apple-tree—one about ten or twelve feet high—such as you will find in an orchard will drink up about fifty gallons of water *every day.* Now your biggest watering can holds about three gallons, so that if you had to supply the needs of that one tree you would have to give it about sixteen cans a day to keep it going! No mean task for you!—and it is fortunate that the roots can search deeply for the water they need to get. Tiny quantities of other substances found in good soil go into the roots along with all this water, but it is sufficient at present for you to remember the importance of the water that the roots absorb.

THE STEM

Most green plants have stems that we can see quite easily. Your groundsel plant has a long, green, soft stem that you can recognize without any trouble. The stem of a tree is made up of its trunk, branches, and twigs, and if you have seen things like runner beans growing in your father's garden, you will know that the stem of this plant is long and thin, and that it winds its way round the support your father has provided. Some plants, however, have such very short stems that you might think they had not any stem at all. The common daisy is one of these, and there are many such plants that seem to sit flat on the soil. They do have a stem, however, though it is very very short, and not at all like the long stems that most plants have.

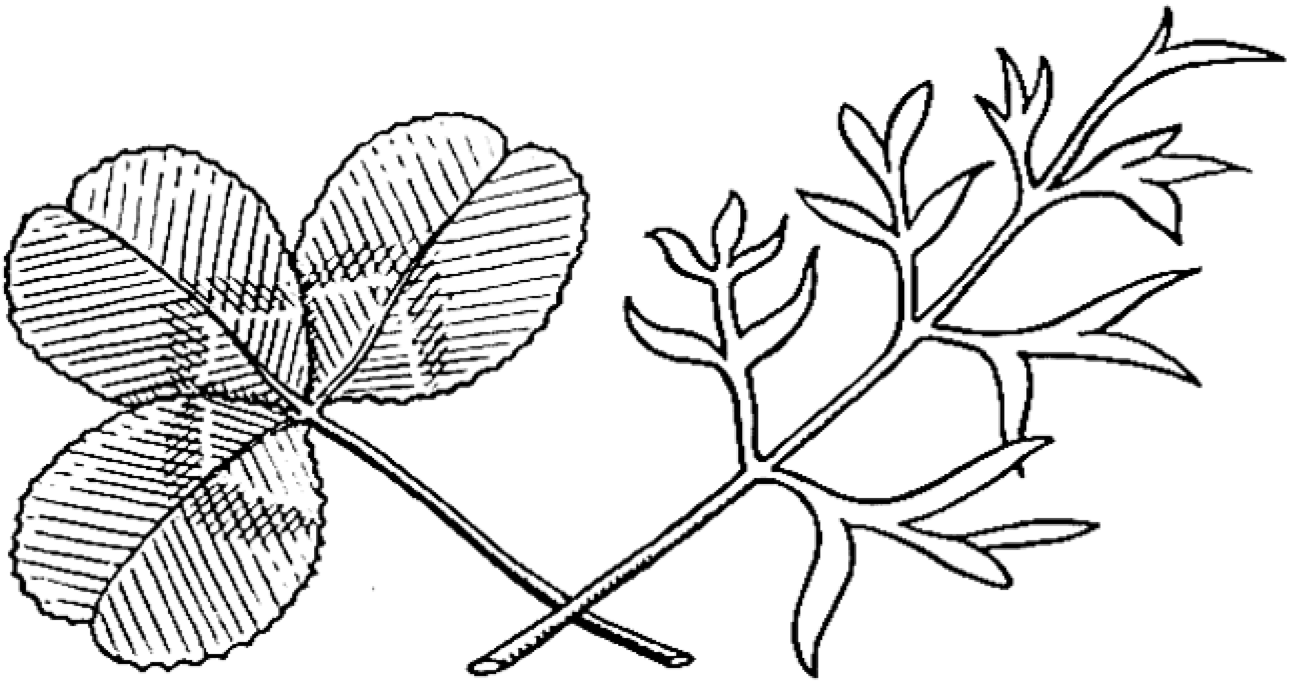
Examine your plant again and you will see that all the leaves and the flowers grow out of the stem. Can you find any that do not? Can you find any leaves growing on the root? No, it is true to say that the leaves and flowers of green plants always grow out of the stem, and it is the stem that holds them up to the air and light they need. The stem is a sort of framework on which the other parts of the plant are fitted: the root at the bottom and the leaves and flowers at the sides and top. Remember also that all the water that goes from the roots up to the leaves has to go through the stem so that as well as being a framework it is also a passageway along which the food and drink of the plant can pass. Sometimes these stems are very strong indeed, and can stand the buffeting of wind and storm. Think how strong the trunk and limbs of a tree must be! The stems of many field and garden plants need to be strong also. Have you ever watched the wind playing across a field of corn? It is a very beautiful sight, and will, no doubt, make you think of the sea. The straw stems must be very strong for their size and weight to stand up to all this blowing about. Other stems, however, do not rely on their own strength, but climb over stronger plants, to which they cling in one way or another. Notice how some kinds of ivy scramble up trees, or how the honeysuckle stem twists its way through the hedgerow in order to get its leaves and flowers up into the air and sunlight. You will be able to find many more examples of this kind of thing for yourself as you ramble about the fields. In the open fields there are many plants that do not bother to raise their stems from the ground at all because there is plenty of light where they are. These plants have stems that creep along the surface of the soil. A good example of this is the ordinary wild white clover that you can find in the pastures on the farm. So you see there is great variety even among ordinary stems, but in spite of this you can always be sure that any part of a plant that has leaves growing on it is a stem.



The long, trailing stem of the white bryony is held in position by twining tendrils.

THE LEAF

It is the leaves of plants that make the countryside of Britain look so fresh and green—the leaves of grass, the many beautiful leaves of the different trees, and the leaves of hundreds of different wild plants that grace our hedgerows. Think for a moment of their many different shapes and sizes: there are the spear-like leaves of the grass, the graceful fronds of the fern, the great hairy leaves of the sunflower, and the tiny leaves of the clover that fold together like fairy hands when the sun goes down. Some leaves, like those of the earth-nut, remind us of delicate lace-work, and whenever we hold up any leaf to the light so that we can see the pattern of its veins, we are sure to wonder at its loveliness.



A leaf of the white clover, and a leaf of the earth-nut.

Of what use are these green leaves to the plant on which they grow? Do they, like the root and the stem, have some special task to perform? It is certain that we never find them except where there is plenty of light and air. You do not find them in deep caves or dark cellars. Think of the potatoes that sometimes get left in the cellar. They will grow tremendously long, yellow stems; but you never see any large green leaves growing on these stems. It seems that there is some connection between sunlight and green leaves. There is, indeed, a good deal to know about what leaves do and most of this you will learn later on. What you are about to learn will perhaps surprise you very much. The green leaf is, among other things, the *world's sugar factory*! All the sugar that you have ever eaten was made in the green parts of some plant—a little of it perhaps in the green stem, but most of it in the leaves themselves. There is no other source from which sugar may be had; man cannot make it nor can it be dug up like coal, or got from the sea or underground streams like salt. It is made only by green plants. And in order to do this the green leaves need to be surrounded by air and sunlight. No wonder most stems grow up towards the light! The less light there is the more nature makes the stem grow in an effort to give the leaves what they need. Of course, we do not bother to get our sugar from the leaves of trees, or grass, or the common hedgerow plants. We get it either from sugar-beet which grows in this country or from sugar-cane, which will grow only in hot countries like the West Indies. We choose these two plants because

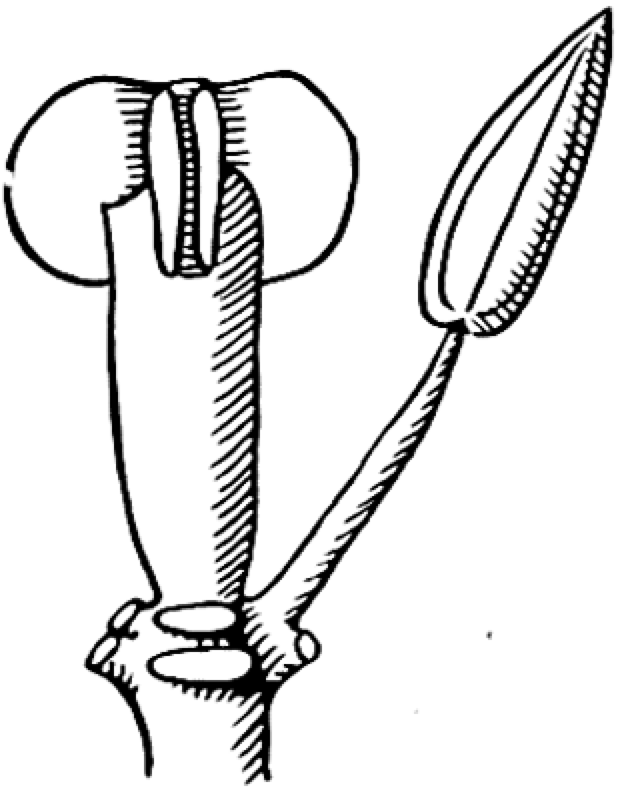
Our sugar comes either from the sugar-beet plant or from the sugar-cane.

they make a lot more sugar in their leaves than most other plants do—and this sugar is very conveniently stored in the swollen root of the sugar-beet or the thick stem of the sugar-cane.

Even so, this does not tell us what use the green leaf is to the plant on which it grows. Does the plant need the sugar? It does indeed. Every bit of the plant's body is *made by the plant itself*—that is one reason for calling it a living thing. And in order to make these new leaves, new stems, new flowers, and new roots the plant must have sugar. Small quantities of other things are used as well, but sugar is the main ingredient, just as flour is the main ingredient your mother uses for her pastry. Since there is no sugar anywhere else in the world the plant must make even this for itself. And this it does in the green parts; largely, as we have seen in the leaves. Now do you see how important the leaf is to the plant? Without the help of the leaves the plant could not go on growing at all. Let us, before leaving this subject, think of one or two of the things that started life as sugar in a green leaf. This is true of wood—and, therefore, of paper. It is true of things like cotton and linen, and anything made from cotton or linen. The book you are reading began its existence in the same way because it is made largely of wood or straw, both of which come from plants, of course. Try to think of other examples for yourself, and you will begin to see that green leaves are very important not only to the plants on which they grow, but also to ourselves.

THE FLOWER

You have learnt already that most green plants produce baby offspring, and that these tiny newcomers are to be found inside the seeds of the plant. You must have noticed that the fruits and seeds you collected earlier in the autumn were to be found where the flowers had been. Indeed they had been left behind by the flowers, and you will conclude quite correctly that the flower is that part of the plant whose business it is to produce young ones. Usually these flowers are very showy and beautifully coloured, but you must not think that the less brightly coloured flowers are any less important to the plant on which they grow. The flowers of the great oak, for example, are tiny green tassels that you might easily fail to notice, but it is from them that the fruit of the tree is produced. The same thing is true of most of the flowers that grow on trees, the main exceptions being the showy flowers of such trees as the apple, horse-chestnut, or the magnolia of the garden.


Here you see the pistil and one stamen of the tulip flower.

Just as male and female animals have to be mated before the young ones can be produced, so the male parts of a flower have to be mated with the female parts before seeds begin to grow inside the fruit. It is quite easy to see the male parts of most flowers. They are called stamens, and consist usually of a thin stem with a little object called an *anther* stuck on top.

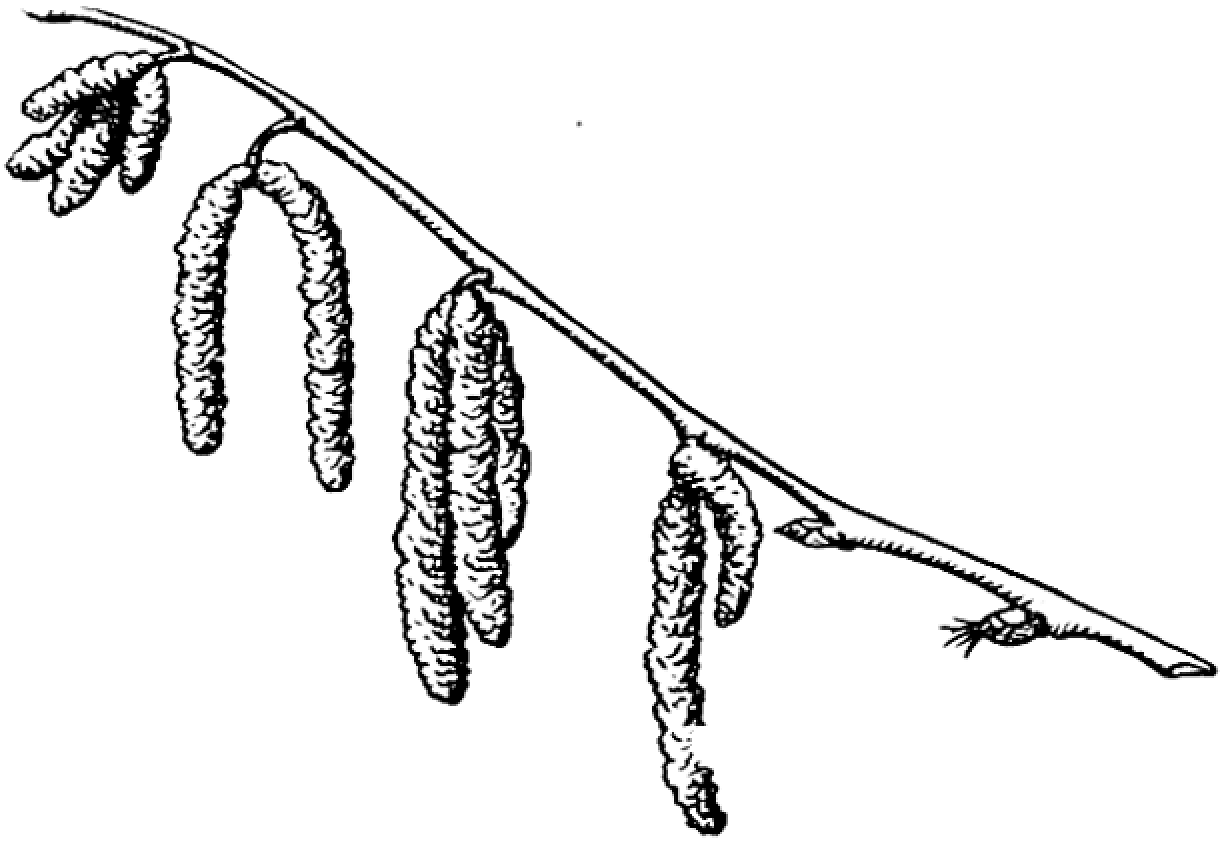
Out of this anther comes the pollen, which looks usually like fine, coloured dust. You can see it quite easily in big flowers like tulips, and so on.

The female part of the flower from which the fruit and seeds will be produced is to be found in the centre of the bloom. You will find it hard to see in your plant of groundsel as each flower is so tiny, but if you choose a large flower the discovery is easy. In the poppy it is the little green box in which you later on find thousands of seeds, and if you are examining a daffodil you will find it just beneath the 'petals.' This female part of the flower which grows into the fruit is called the *pistil*, and very often, though not always, it has a pin-like projection on it called the *style*.

The fruit of the poppy is called a capsule. Can you see the pistil and stamens in the middle of the flower?

Before the seeds can begin to grow, pollen has to be carried in some way from the anthers on to the top of the pistil, and when this happens 'mating' takes place, and if this is successful the seeds will begin to grow and the pistil will become larger and develop into the fruit. Thus the pistil of the garden pea flower becomes the pod full of peas, and the pistil of the cherry flower becomes the cherry with one seed (the kernel) inside the stone.

The pollen may get from the stamens on to the pistil in one of several ways. It may be blown by even the slightest breeze, and this is what happens in the case of most tree flowers. It is true, for example, of the oak-tree flowers, and you must have seen the dusty pollen being blown from hazel catkins by the wind. Also the flowers of grasses are pollinated in this way.



Hazel catkins contain stamens only. The female flower is in the tufted bud.

Notice that flowers that rely on the wind for pollination are not very colourful as a rule. The pollinating of coloured flowers is usually helped by insects, and the flowers are coloured in order to attract these valuable servants. The ordinary honey-bee is a good example of such a visitor though there are many others, such as butterflies, moths, flies, and so on. The bee, of course, does the pollinating quite unawares and visits the flowers for its own special reason: which is to gather pollen and nectar for food. Nectar is a sugary liquid found in many flowers. As the bee moves about the flower, however, in search of its

Many flowers are pollinated by bees.

plunder, it gets dusted with pollen, and sooner or later some of this pollen will get on to the pistil. You see what a useful arrangement nature has made here. The bees could not do without the flowers, as that is where they get most of their food; nor could the flowers do without the bees and suchlike insects, otherwise not much pollen could be transferred to the pistils. One helps the other, and so life goes on happily for both. It is a good lesson in helpfulness!

Usually the coloured parts are the *petals*, and underneath these you will often find another set of small green 'leaves' that served to protect the flower when it was still a bud. These protecting 'leaves' are called *sepals*. But you will find many variations so do not be confused if you do. In the case of the tulip, for instance, there are no petals; instead, the green sepals that form the outer covering of the bud become colourful and attractive themselves when the flower opens. This is true also of the marsh marigold, and many other wild flowers. You should seek for examples yourself.

THINGS TO DO

(1) Write a short paragraph with one of the following titles:
What roots do for the plant.
From green leaf to linen table-cloth.
Our sugar.
The way bees help plants to produce seeds.

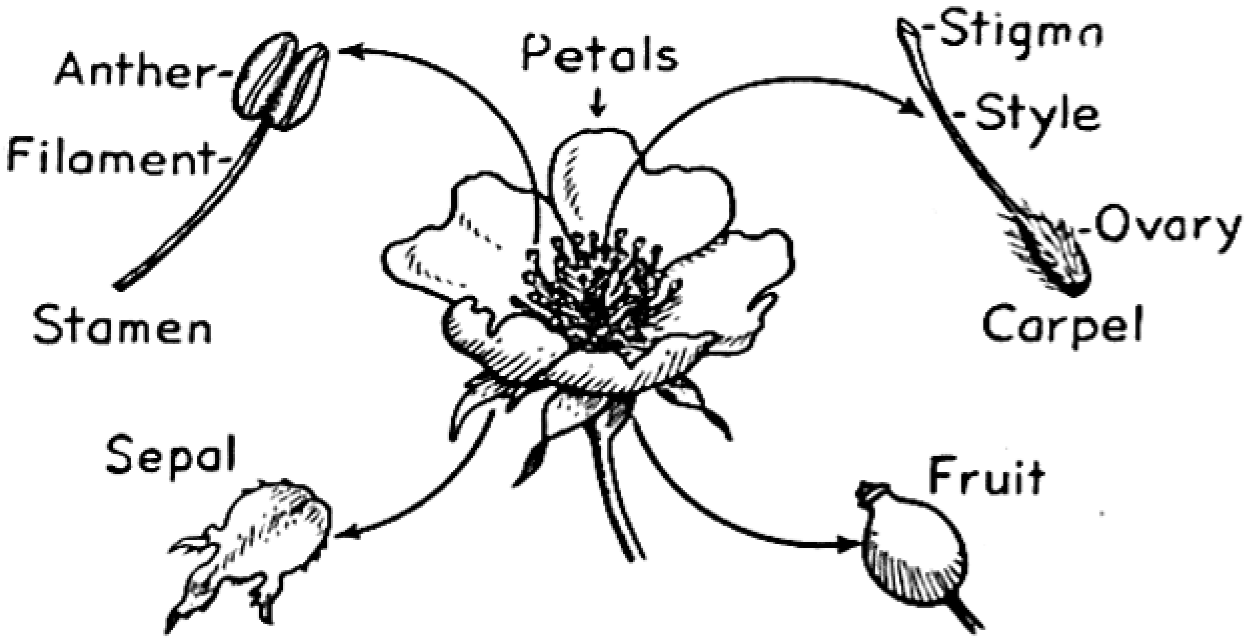
(2) Use single sentences to answer the following questions (the first one is done for you). Example:

(*a*) Trees do not blow over easily in a strong wind because they are fixed firmly in the soil by their roots.

(*a*) Why do not trees blow over easily in a strong wind?
(*b*) Why do most stems grow upwards?
(*c*) How can you be sure which part of the plant is a stem?
(*d*) Why do the stems of some plants need to climb over other plants?
(*e*) What common substance is manufactured in green leaves?
(*f*) What two 'things' do green leaves need in order to do their work?
(*g*) From what part of the plant do baby plants come?
(*h*) What must happen before seeds can form?
(*i*) Why are some flowers coloured?
(*j*) Why are some flowers not very coloured?
(*k*) Why do bees visit some flowers?

(3) Collect ten different kinds of green leaf from wild plants and make neat drawings of them in your book. Label each one with the name of the plant.

(4) Collect five different kinds of wild flowers that are brightly coloured. Make neat drawings of these in your book, and using tiny arrows label the pistil, stamens, petals, and sepals.



(5) Find three wild flowers that have coloured sepals but no petals, and write down their names in your book.

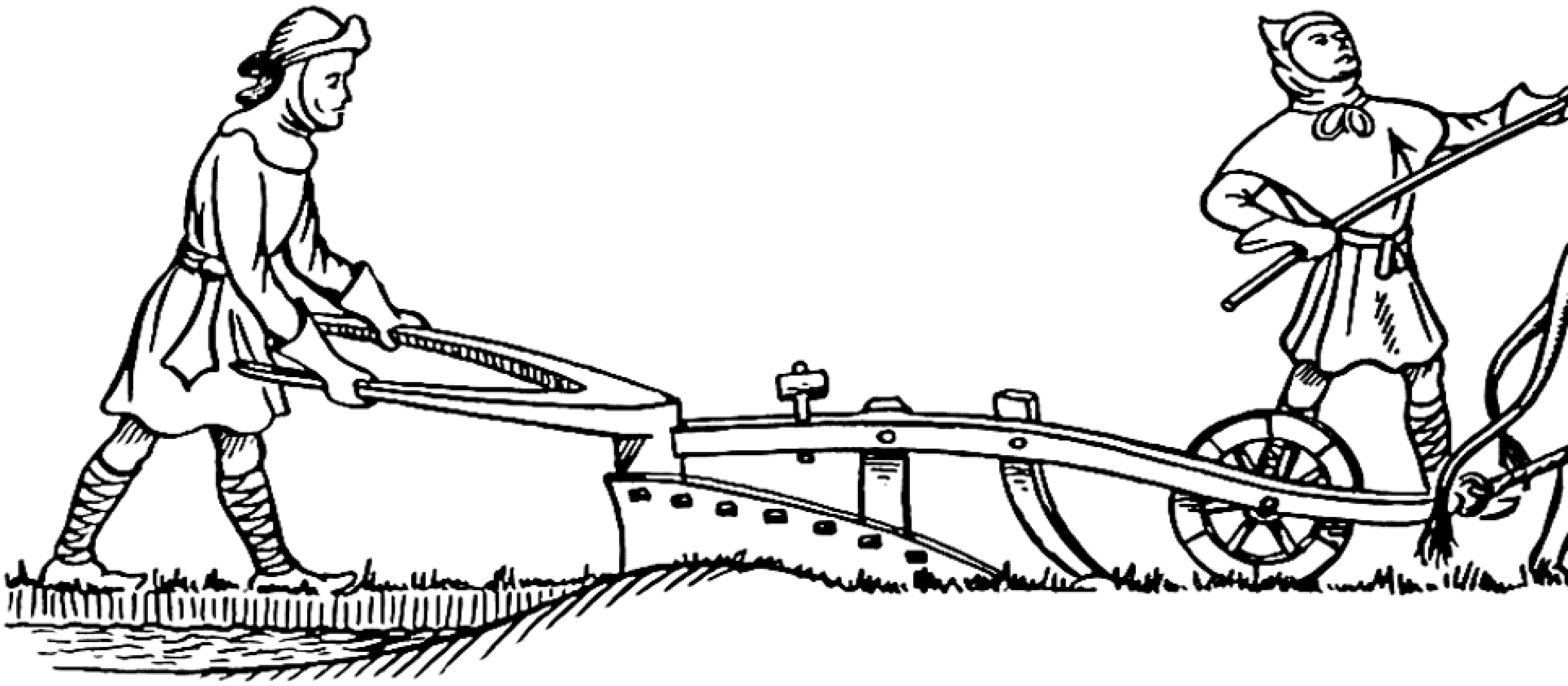
6

Power on the Farm

Give me another horse! bind up my wounds!
Have mercy, Jesu! Soft! I did but dream.
O coward conscience, how dost thou afflict me!
Richard III (SHAKESPEARE).

NOWADAYS most of the heavy work on farms is done by horses and tractors; and even in the farm buildings engines are often used to lighten the farmer's labour, so that, instead of having to prepare the food for his livestock by hand, he uses machinery to slice his turnips and mangolds or to chop his hay or to milk his cows. But in very ancient times even the fields had to be tilled by hand, as there were no ploughs or other such implements, and no animals were used for working the land. Everybody must have had to work very hard to get even a bare living, and we cannot wonder that there was little time for doing other things.

Then some unknown farmer had the idea of teaching his beasts to help with work in the fields and the first plough was invented. This was a very simple affair made of wood, and did little more than scratch the surface of the soil, but it was pulled by oxen, and it became possible for men to till more soil and grow food more easily. Even to-day oxen are still used on farms in many parts of the world. If you go to Spain, for example, you are sure to see them at work, and on many a small farm in Belgium it is no uncommon

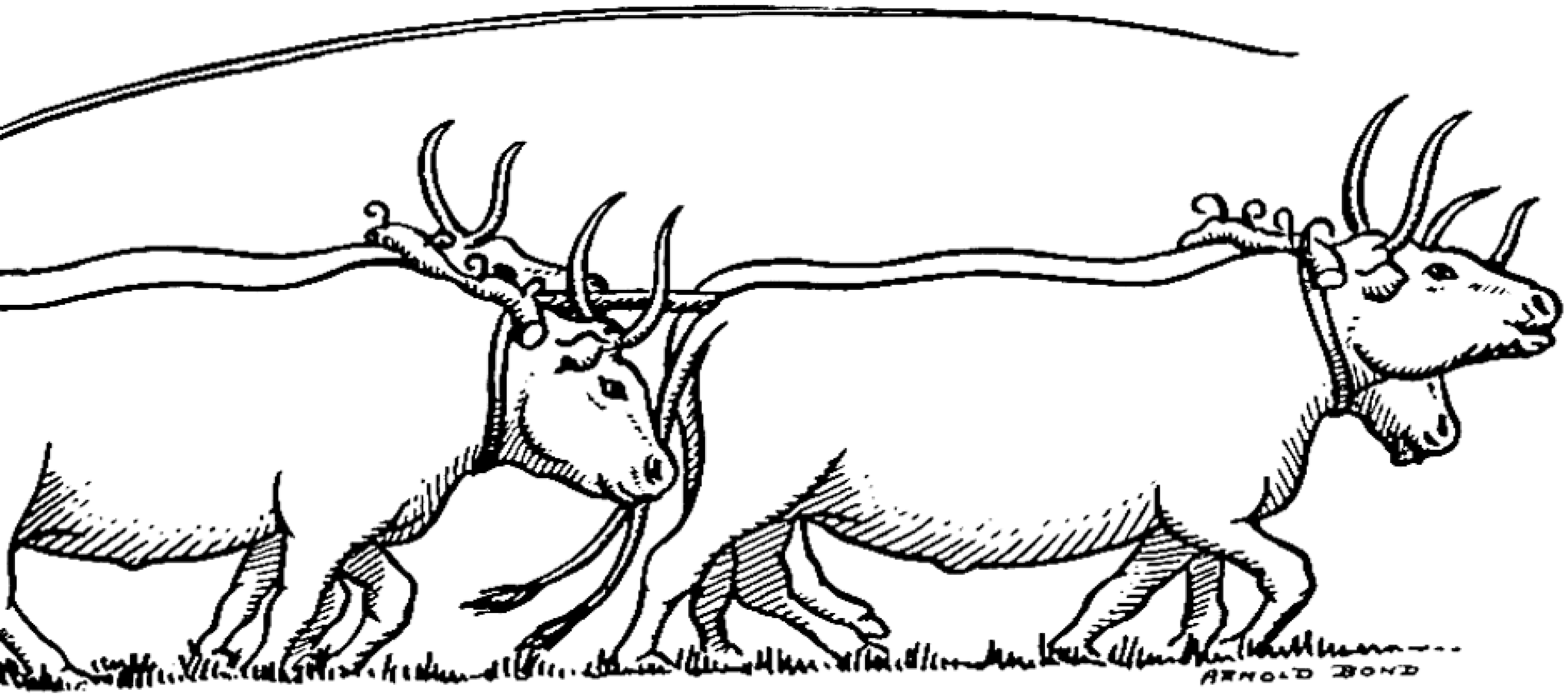


Ploughing in the Middle Ages. What prevent

sight to see a farmer pulling his own plough with the help of a dog in harness.

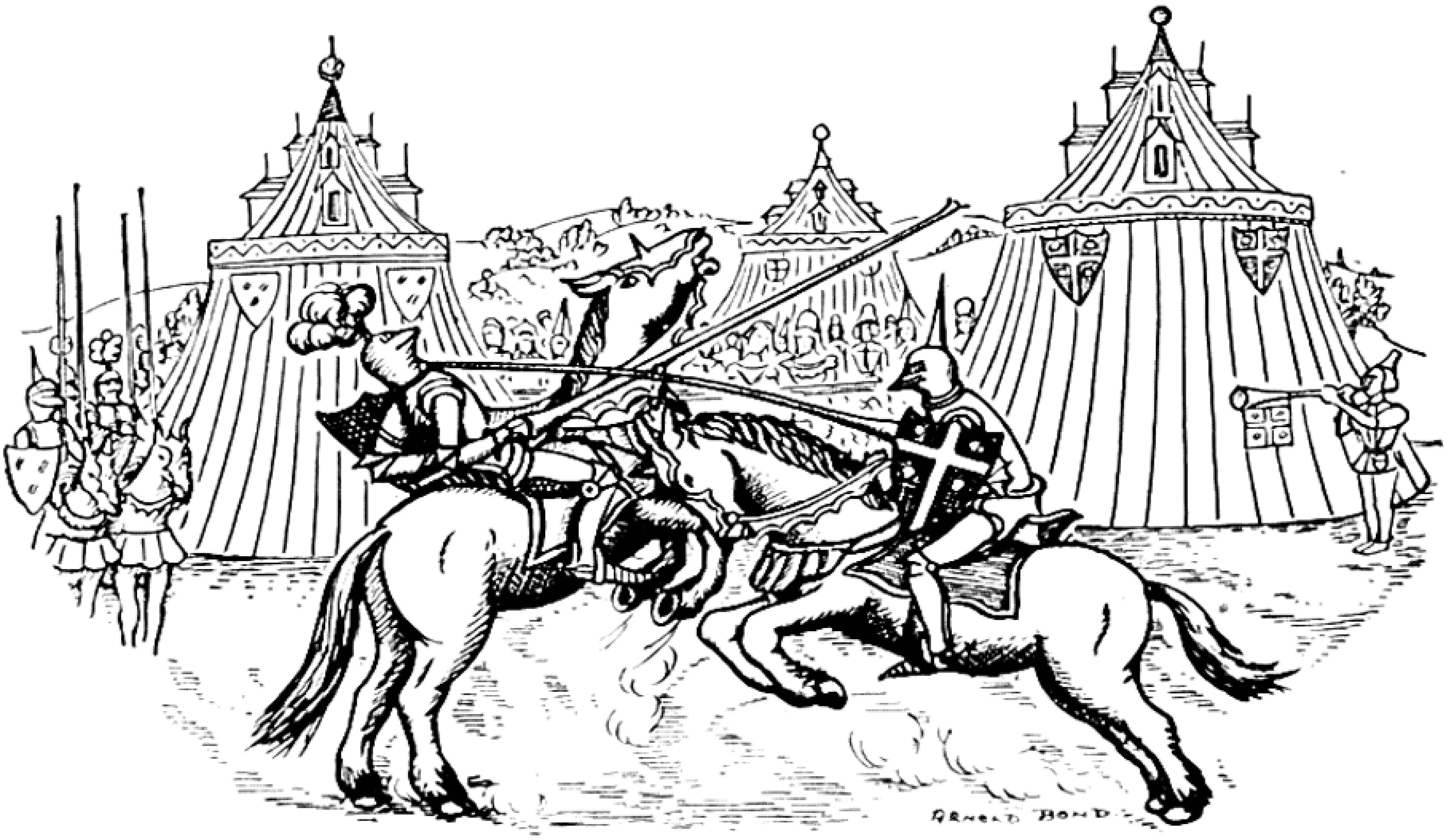
WHERE DID THE FARM HORSE COME FROM?

This use of oxen went on for very many centuries, and they were the common source of power on the land right up to the time of Charles II, and even at the beginning of the nineteenth century during the Napoleonic wars, oxen were not uncommonly used in the Lake District for ploughing the fields. Where did the heavy farm horses of to-day come from? And when did they begin to replace oxen on the farms? To answer these questions you must let your mind go back to the days of Henry VIII, and even further to the times of the Black Prince and of Richard the Lion Heart and to what we call the Middle Ages. In those days horses were much used by travellers who often had small ponies to carry them and their goods up and down the country.



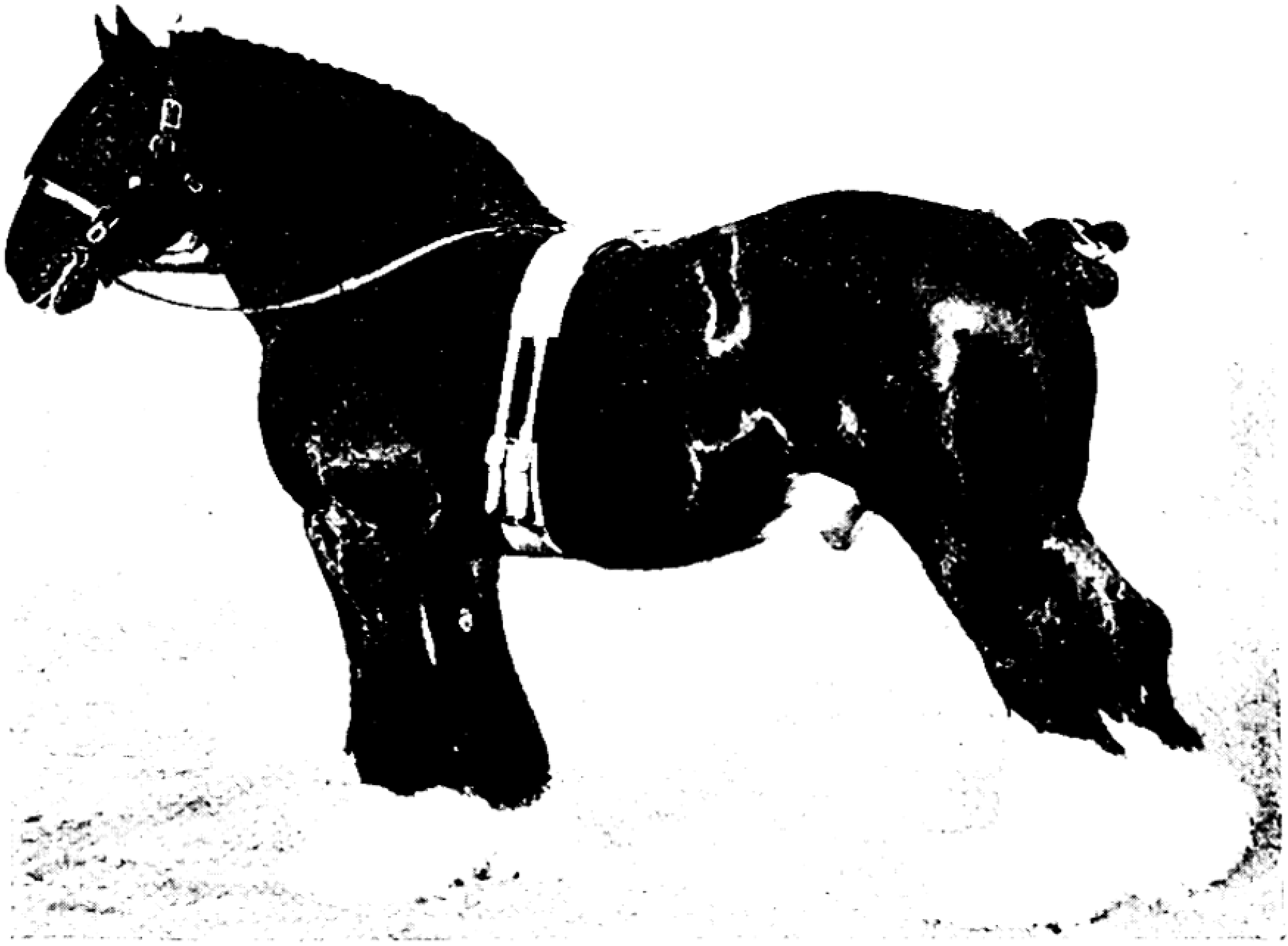
e plough from digging too deeply into the soil?

You will remember, however, that knights in armour rode into battle on horseback, and that horses were used in the jousting sports at tournaments. In these tournaments the two competitors and their horses were clad in gloriously decorated armour. At a sign from the judge they charged from opposite ends of the jousting field amid the cheers and screams of the assembled spectators, and as they charged each knight sat hard in his saddle and directed his lance at his opponent with the idea of unhorsing him when they met at top speed. This performance was repeated until one of them was thrown from his horse, the winner remaining seated and victorious. It was a thrilling and dangerous sport, but very suited to men that had to do the same thing in battle. These jousting grounds, as the tournament fields were called, were often surrounded by high walls, and many of them are still in existence. You should ask your teacher if there is one in your county. If you can see one it will help you to imagine the colourful pageantry of bygone days. There is one very good example at Gawsworth in Cheshire, and another at Berkhamsted in Hertfordshire. The horses used by these knights had to be very powerful in order to carry so much weight at a full trot. The total weight of knight and armour—including the horse's armour—was well over half a ton, and in breeding the animals that were to be used for tournament or battle only the biggest stallions and mares—male and female horses—were used. This method of breeding always produces the desired results, and you will remember that the same method was used to produce our modern breeds of cattle. Indeed, King Henry VIII put forward a law that prevented horse-breeders from using inferior stallions on their mares as he was very anxious to see a continued improvement in the heavy breed of horses. By this time a few of these bigger animals



A jousting scene in medieval times.

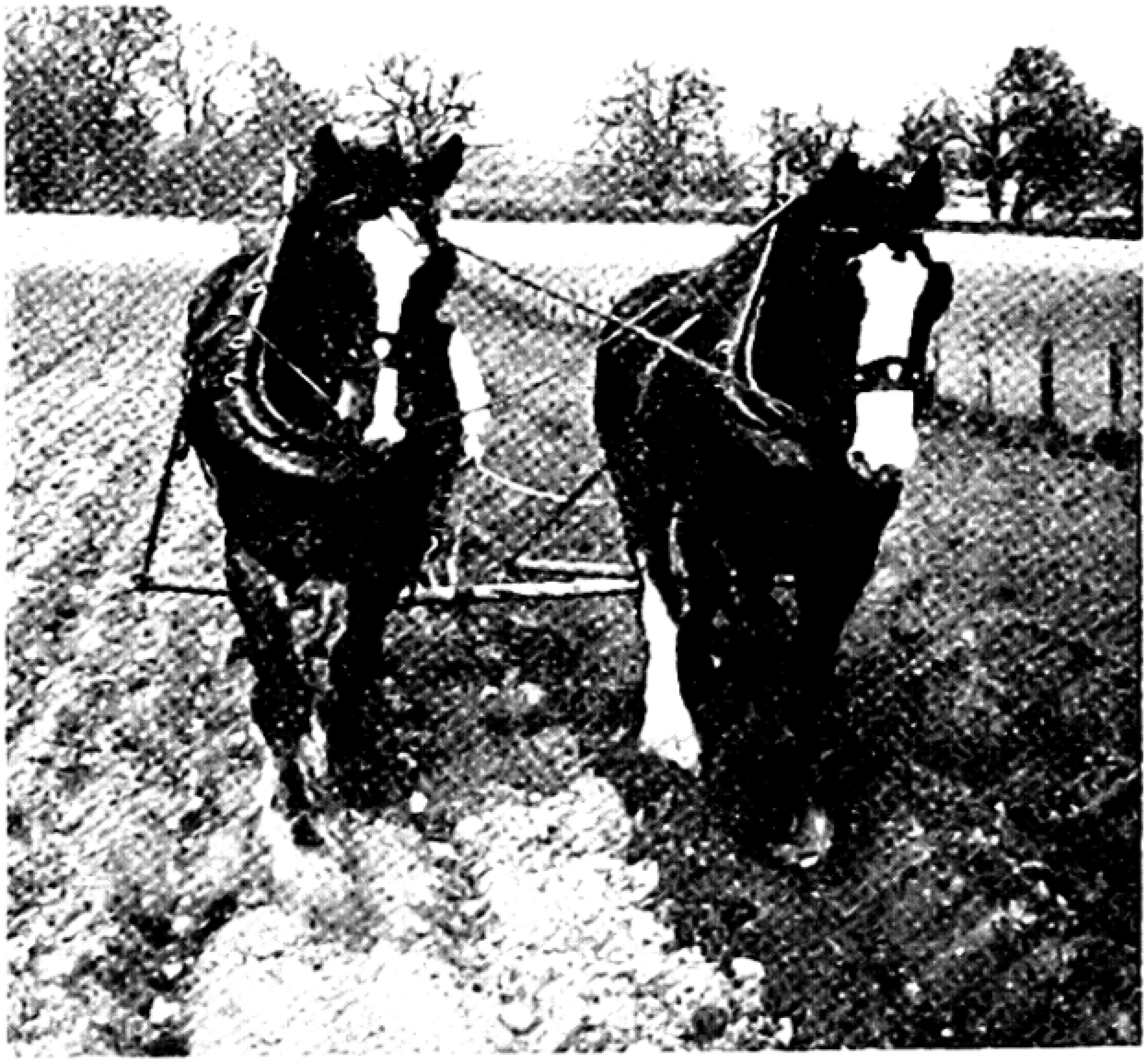
were being used along with the oxen on farms, but it is important for you to remember that they were still regarded as war-horses, and that they had been brought into existence for the purposes of battle. It was not until two hundred years later, in the early part of the eighteenth century, that horses really began to replace oxen on the farms, and most of the heavy cart-horses that we see to-day are descendants of the war-horses of far-off days. Try to remember this the next time you are helping with the horse you know best. Perhaps he sometimes thinks of his former glory as he munches his evening meal? Anyhow, you can do the thinking for him and give him a



This noble animal is a Shire stallion.

pat and a word of praise in memory of his glorious ancestry.

The two main breeds of farm horse in England to-day are the Shire and the Cleveland. They are fine, noble animals, and very intelligent—soon learning to do their jobs under the guidance of a firm but kindly teams-man. Think of the way in which the horse avoids putting his feet on the crops as he draws the hoe up and down a field of turnips or mangolds! He could soon do a good deal of damage if he trod in the wrong places, as he weighs almost a ton, you know! And when he is helping to draw a ridge-plough to cover the rows of seed potatoes he is careful to walk only on top of the ridge. You must not think that the farmer does all the guiding—the horse knows



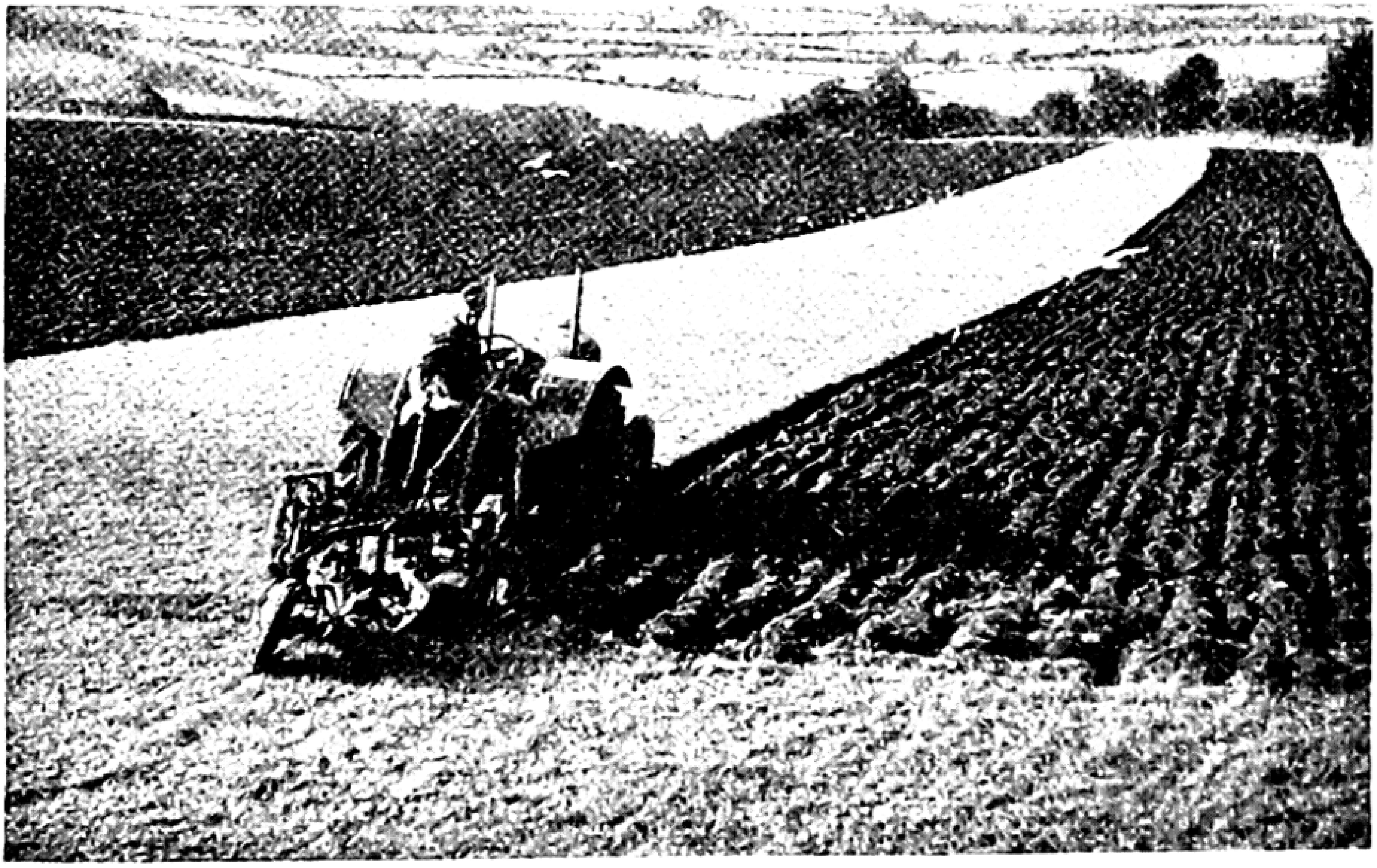
Covering the seed potatoes. Notice that one horse has to pick his way carefully along the top of a ridge.

perfectly well what is going on and takes good care to play his part. No wonder horse and master get fond of one another, and become good companions; no wonder, either, that many farmers are unwilling to lose all their horses now that the tractor has come along to do most of the heavy work in the fields. You cannot get on very friendly terms with a tractor, however useful it is! However, the tractor has come to stay so we had better look at some of the reasons. We shall see that there are two good ones.

THE TRACTOR

First of all the tractor does most jobs in the field much more quickly than horses can: not only because it moves more quickly, but also because it can pull more implements. For instance, even a team of three horses cannot pull more than a two-furrow plough, whereas a tractor can turn four or more furrows at the same time. This means that one man with his tractor can plough more acres in a day than he can with a team of horses, and so the cost per acre is lower. Can you see why? The cost to the farmer per day for three horses and one man is about the same as the cost of a tractor and one man, so that the extra land that the tractor ploughs does not cost any extra money. Here, then, is the first reason for using a tractor: *most of the jobs in the field are done more cheaply.* It might interest you to know that the cost to the farmer for the ploughing of an acre of average land (not too sticky, not too sandy), is at present (1950) about 11*s.* if he uses a tractor, and about 15*s.* 6*d.* if he uses a team of horses. That is a big saving when you think of all the acres that have to be turned over.

Another and equally important reason for favouring the tractor is also due to the greater speed of working compared with horses. A farmer can work his fields, sow his seed, reap and gather his crops only when the weather is suitable. The weather in this country is very changeable, and it is necessary to make the very best use of the fine days that come along and the quicker a job can be done while the weather is fine the better. Speedy work enables the farmer to 'keep abreast of the calendar,' as he puts it, and to get all his jobs done in the right season. Nothing is worse, for example, than a failure to get the seeds into the



A tractor plough at work in the Mendip Hills. How many furrows does it turn at a time?

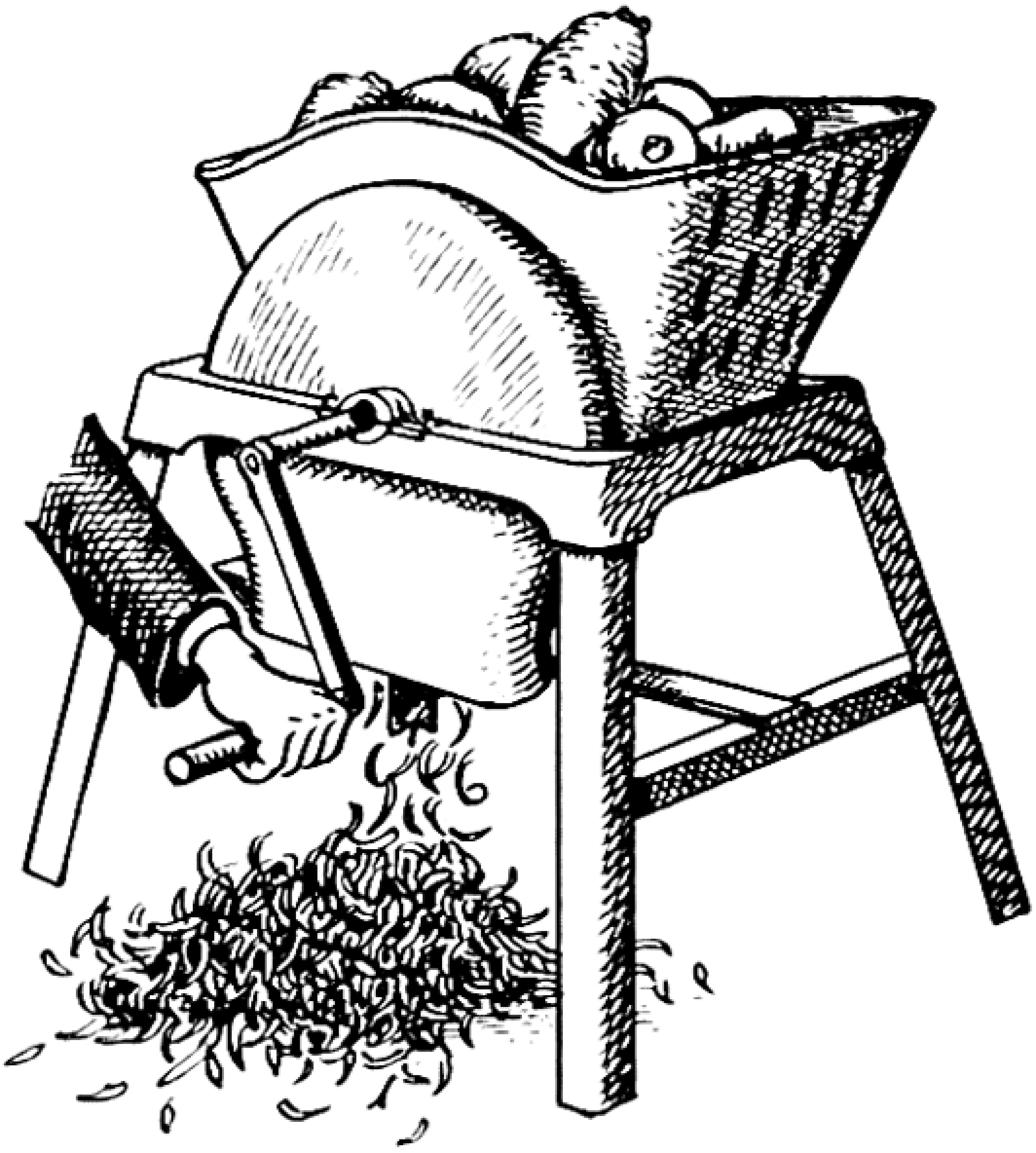
soil at the right time. One or two fine days may not be long enough for horses to do the job, but a tractor will make good use of even the shortest fine spell, so that it really has a very important advantage over the horse.

It is important, of course, for the farmer to use his tractor to the best advantage, otherwise it may turn out to be more costly than a horse. On a good farm the tractor is made to pull more implements at a time than a horse can pull—and so cover more acres. Very often you see a tractor pulling two or three rollers or other implements. This is as it should be, and you may be sure that a farmer who does this knows what he is about.

In spite of these great advantages there are jobs on the farm that can be done better or more cheaply by horse labour, so that if you are a lover of horses you need not despair. It is doubtful whether many farmers will ever be able to do without horses altogether—even if it is only to pull the tractor out of muddy land in which it has got stuck! There is a good deal of odd carting to be done about the farm and farm buildings—the shifting of small quantities of hay, straw, food for stock, and so on. And there is often enough a wet stretch of farm road or a very sticky field over which it is unsafe to take a tractor for fear of getting it stuck. Such jobs as these will always need a horse, so that our old veteran of the jousting ground and battle-field is likely to stay with us for a long time yet. There are still nearly one million heavy horses in use in Britain to-day in spite of the tractor.

OTHER ENGINES ON THE FARM

Before the winter foods like mangolds and turnips are fed to cattle they are frequently sliced up in a special machine. No doubt you have turned the farmer's slicer at some time or other. It consists of a large hopper into which the roots are placed, and alongside this is a revolving wheel on which the slicing knives are fixed. There are also other machines that are used for preparing the cattle food. Hay can be chopped up in one such machine, and nowadays the farmer is able to prepare his own grain—such as oats and barley—by the use of a hammer mill. This mill breaks up the grains so that they can be more easily digested by the livestock. Formerly this job was done at the nearest water-mill or windmill, but it is much more convenient and less costly to do it on the farm. On some farms an engine is used to drive all these different machines, and if you know of such a farm you will have heard the familiar 'phut-phut' when the machinery is running. Wherever there is a milking-machine, of course, a small fixed engine of some



Using a hand machine to slice mangolds.

kind is necessary to drive the suction pump. You may think that all this extra help from powered machinery makes the farmer lazy, but that is not so; he has more time to attend to other things, and to give greater thought to the care of his cows and the planning of his farm.

There is always plenty of work on a farm, and the more help that can be got from clever inventions the better. Perhaps, when you grow up, you will invent some valuable mechanical contrivance for use on the farm. It would be a great service to do so. Remember that we have come a long way since the days when men tilled the land themselves, but there is still further to go. All the food that we eat and most things that we wear come from some kind of a farm, so that farming is very important indeed.

THINGS TO DO

(1) If there are both horses and a tractor on the farm you know, find out what sort of jobs the horse is used for and why. Then write a short paragraph entitled 'The Importance of the Horse.'

(2) Watch a hay chopper at work and then write a short paragraph entitled 'How a Hay Chopper Works.' Do not forget to use two sentences saying when and why it is used.

(3) Use single sentences to answer the following questions:

- (*a*) What was the first animal to be generally used for ploughing?
- (*b*) Can you think why this animal was chosen?
- (*c*) What were heavy horses first used for?
- (*d*) For what reason is the tractor better than the horse for most farm jobs?
- (*e*) What machines on the farm are often driven by an engine?

(4) Pretend you are at a tournament in olden days. Give an account in two or three paragraphs of what you see.

(5) Find out from your local farmer how many acres a day he expects to plough with his tractor and with his horses. Write your discoveries in clear sentences.

(6) Name four different substances used in making clothing, and say in four sentences how each comes from a farm.

Example: (i) Wool is used for cloth and it comes from the farmer's sheep.

N.B.—Next week you are going to need a jam jar and a handful of soil, so get these things ready.

7

What is Soil?

> Though drained the land 'tis clay land still.
>
> OLD FARM SAYING.

> Most subject is the fattest soil to weeds.
>
> *King Henry IV*, *Part 2* (SHAKESPEARE).

WHAT THE SOIL DOES FOR THE PLANT

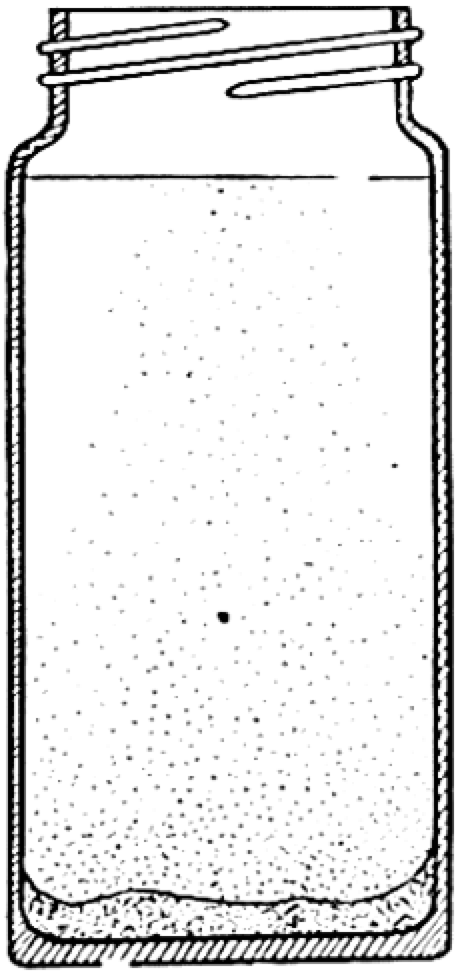
WHETHER you grow plants in a garden or on fields, or even in pots, you will generally be growing them in soil of some kind. It is true that some water plants do not need to have their roots in soil, but these are very unusual exceptions to the general rule. You will have heard farmers and gardeners talking about 'heavy' soils, 'sticky' soils, 'light' soils, 'hungry' soils, and so on; and it is clear from this that the soil in one place is not always the same as the soil in another. In spite of these variations, however, any soil that will grow plants must be able to supply the plant with the needs that we have already learnt about:

1. It must be firm enough to enable the plant roots to get a firm hold in it.
2. It must be able to hold water like a sponge, so that the rain that falls does not drain away too quickly as in the case of sand.
3. It must be able to supply the plant with tiny quantities of the important food substances that go into the roots along with the large quantities of water.

There is also a fourth point about which we have not so far thought: although the soil must be able to hold water like a sponge, it must not hold too much and so become altogether waterlogged. Such a soil would be too cold for one thing and, apart from this, plant roots need a certain amount of air as well as plenty of water—and so there must be air spaces in the soil. Let us see what there is in soil that makes it possible for it to do all these things.

EXAMINATION OF SOIL

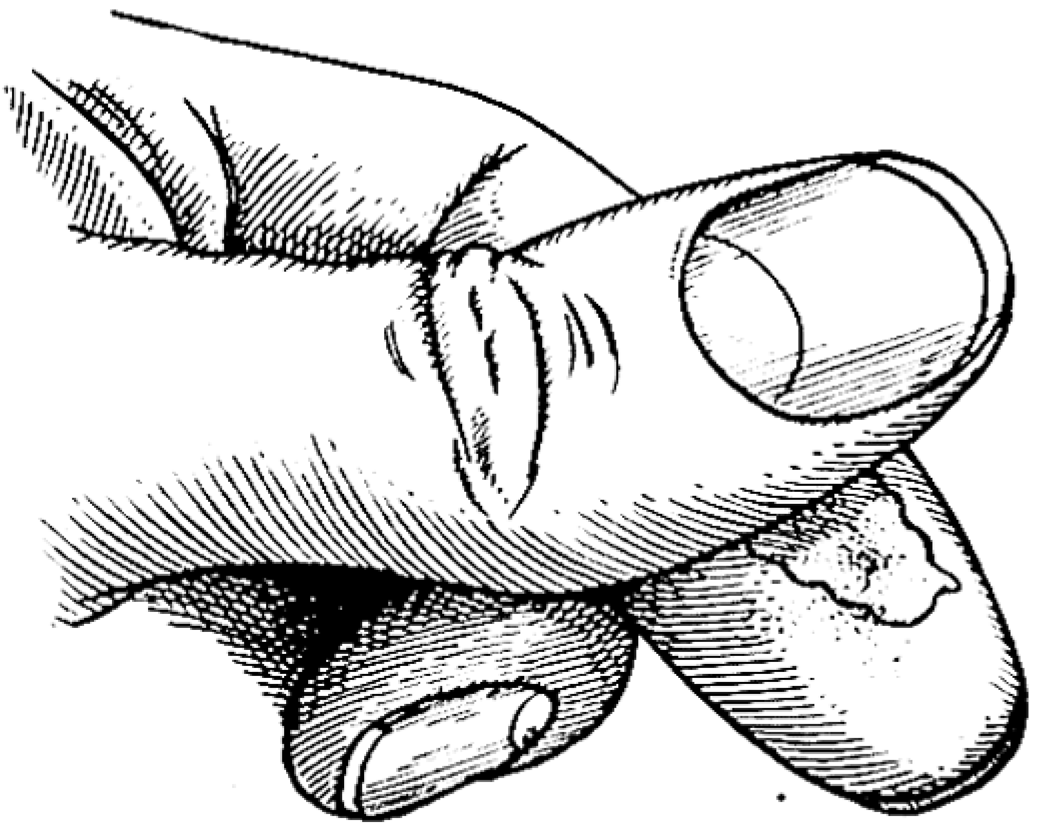
Experiment 1. Place a handful of garden or farm soil into a jam jar—the taller the jar the better—fill up the jar with water, and shake it so as to mix the soil and water together. Now place it on your desk and watch carefully to see what happens. What do you see? Some of the soil falls quickly to the bottom of the jar, and some of it remains in the water making it look muddy. We are beginning to separate the ingredients of the soil in this way: rather like taking the currants out of a cake!



The heavy particles of sand settle quickly in a jar of water.

After a few moments pour off the muddy water into a dish, and after putting more clean water into your jar shake it up again and allow it to settle. You will then be able to see clearly what it is. *It is ordinary sand.* We have found out one thing that most soils contain. Now let us examine the other part that you poured off.

Empty your jar and pour into it the muddy water that is in the dish. You will find that a certain amount of fine sand has settled in the dish, but you can leave this behind. All you need is a jar full of the cloudy water. The part of the soil that is in this water will not settle very easily, so we add a few drops of a liquid called *dilute hydrochloric acid.* This causes the mud to settle easily. When it has settled pour off the water. What is the stuff in the bottom of the jar? Get some between your finger and thumb and feel it carefully. Is it gritty like sand? No, it has the smoothness of silk and it is *clay.* If the soil you are using was 'heavy' soil you will find a good deal of this clay. If, however, it was a 'light' soil you will not find so much. But in most cases you will find some. (If you live in Fenland you should not use the black fen soil for this experiment as that soil is rather different.)

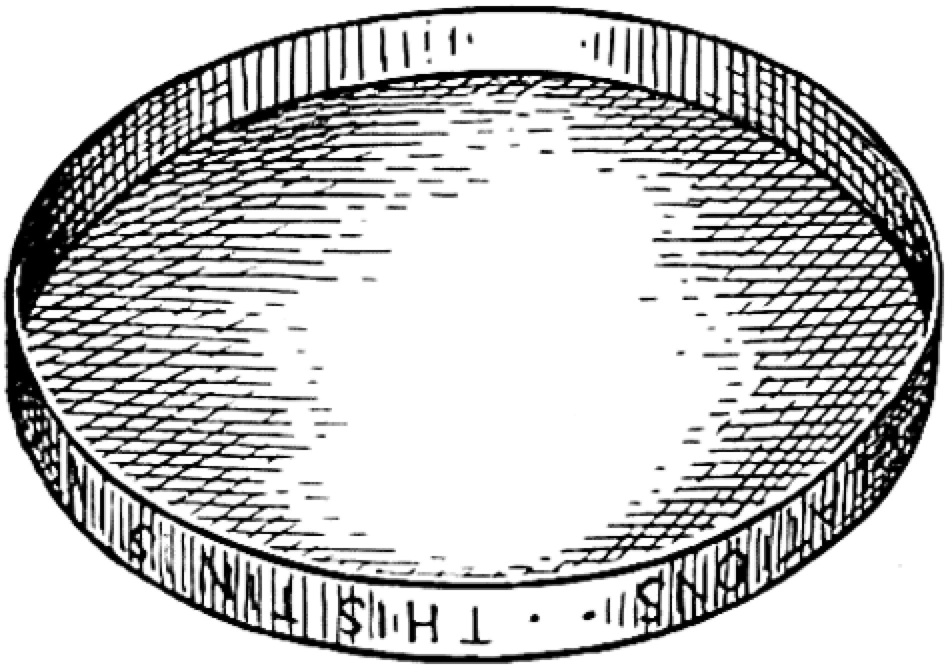


Sand feels gritty; clay is as smooth as silk.

We have now found two ingredients of soil: gritty sand and smooth clay. Where have these materials come from? Far back in the history of the earth there was no soil at all—only rocks; and both clay and sand have come from those rocks either by decay, as in the case of clay, or by being chipped off, as in the case of sand. This process began a very long time ago, of course: millions of years ago, long before there were any gardeners or farmers at all, or, indeed, any people of any kind.

Is there anything else in the soil? You know that neither clean sand nor clean clay is black in colour, so that the black part of your soil must be something else. What is it?

Experiment 2. Perhaps your teacher will have to do this experiment for you, but here are the instructions in case you can do it for yourself. You *can* do it on the gas stove or electric stove at home, but there may be a special room at your school where it can be done.



Heat your soil in an old tin lid.

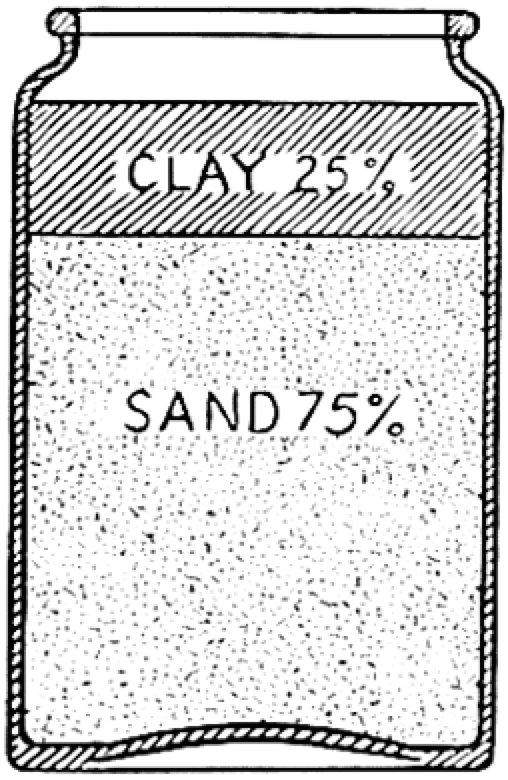
You will need a tin lid, such as the top of a boot polish tin. Give this a good heating over the gas so as to burn off all the paint. When no more smoke comes from it you will know that it is ready. Now, taking care not to burn your fingers, put about two teaspoonfuls of fairly dry soil into it, and go on heating it with a good hot flame. Very soon smoke will begin to come away from the soil, and there will be a smell of burning. Stir the hot soil from time to time with a piece of wire. Gradually the black part of the soil will be burnt away, and you will be left with the brown sand and clay. Let us think about this.

Neither sand nor clay will burn away. However long you go on heating them they will not disappear in smoke as the black material has done. What is it that has been burnt out? It is the decayed remains, not of ancient rocks, but of living things, largely plants. When plants die their leaves and stems and so on get mixed with the soil and decay, or 'rot down' as we sometimes say; and the result of this rotting is the black material we have just been examining. So important a part of the soil is this rotted material that gardeners and farmers add it to their gardens and fields in the form of manure. This may be farmyard manure which is made up of straw and the dung of farm stock (both of which have been living plants at some time), or it may be such things as bone meal or even things like dried blood. Anything at all that has once been living and that will decay in the soil may be used. There is a special word used to describe such materials. We call them *organic* remains. You should remember this word.

HOW SOIL WORKS

Now that we have found the main ingredients in soil let us see how they work together to supply the plant needs that we were discussing on page 77. First of all a firm root hold is needed. If you have ever planted a Christmas tree in a tub you will know that sand alone will hold the roots of the tree very firmly. This is equally true of pure clay. So far then we don't need a complicated soil. Both sand and clay are very heavy substances, as you will know if you have ever tried moving them about in a wheelbarrow; and either of them can give a very firm hold to the roots of even the biggest tree.

Let us examine the second need—water. This is where we begin to see the snags of pure sand or pure clay. Sand is like a sieve to water, it lets all the rain run through, and is soon quite dry again after even the heaviest downpour. There is no sponge-like effect here. Clay, however, soaks water up like blotting-paper, and soon becomes sticky and waterlogged. But, as you remember, plant roots need air as well as water, so that pure clay is no good either. What is wanted is something between the two, and that is why we need both sand and clay in a good soil. The clay holds plenty of water, and the sand allows a certain amount of air to get in as well. The best soil of all is called a *medium loam* and about a quarter of this soil is clay. Such a soil will hold plenty of water in the clay part, even in the longest drought, and at the same time the sand in it keeps it open and airy. Clay also provides plants with some food, but sand does not.



A *medium loam* contains about 25 per cent of clay.

What does the black organic material in soil do? It has two uses about which you can learn at present. First of all it supplies some of those important food substances that the plant must have in small quantities. That is why it is so necessary to put manure into the soil—the farmer always gets better crops if he uses plenty of manure—and small gardens are often quite black with it. This, however, is not the only benefit the soil gets from organic material. When it has rotted down thoroughly it begins to behave rather like clay: it soaks up water very easily; and the best way of improving light sandy soils that do not contain much clay is to add plenty of farmyard manure. This does not only provide food substances for the plants, it also enables the soil to hold water for the plant roots. This is very important indeed, and those farmers and gardeners that have to work sandy soils try to use as much manure as possible. By doing this they make up for the lack of clay in the soil. There are other things in soil besides these three—sand, clay, and organic matter—but you will learn more of them later on.

DIFFERENT SOILS HAVE DIFFERENT CROPS

You now know why the soils on different farms are often so varied. Some soils contain a large amount of clay, and are called 'heavy' soils because they are sticky and difficult to work. Soils of this kind are found in various parts of Britain. In the west they are often used for grass and that is why most of the best dairy farms are in the west. In the eastern parts of England, however, the clay-land farms are used more for wheat-growing because wheat likes the drier climate that is found in the eastern counties, and it also grows best in a heavy soil.

In some parts of the country, however, the soils are very sandy and 'light.' Farms with soils of this kind are especially valuable for the growing of potatoes, which like an open sandy soil, and it is easier to harvest them than it would be if they were growing in a very heavy clay soil. Many of our very early potatoes come from light-land farms in Cornwall or Cheshire. You should try to find out for yourself whether the farmers near to you choose any of their crops because the soil is very suitable to them. It is important for

Potatoes grow best on light, sandy soils.

you to remember that a farmer cannot grow just what he would like to. He has to consider many things, and one of these is the soil that he has on his farm. That is something he cannot easily change.

THINGS TO DO

(1) Write a paragraph saying simply and clearly how you separated some of the sand from your specimen of soil.

(2) Write single sentences in answer to the following questions:

- (*a*) Why is sand a valuable ingredient of soil?
- (*b*) What do we mean by *organic* matter?
- (*c*) What two important things are done by the organic matter in soil?
- (*d*) Why is organic matter important in a sandy soil?
- (*e*) What do plant roots need in addition to plenty of water?

(3) Ask your farmer friend what organic manures he uses in addition to farmyard manure. Write down a list of these and say what plant or animal each comes from.

Example: Bone meal—from the bones of dead animals.

(4) In going round the fields in your district try to find one with sandy soil and one with a heavy clay soil. Then write down where the fields are, and say why you think the soil is sandy or clayey in each case.

(5) Write a paragraph entitled: 'Crops for Different Soils.'

8

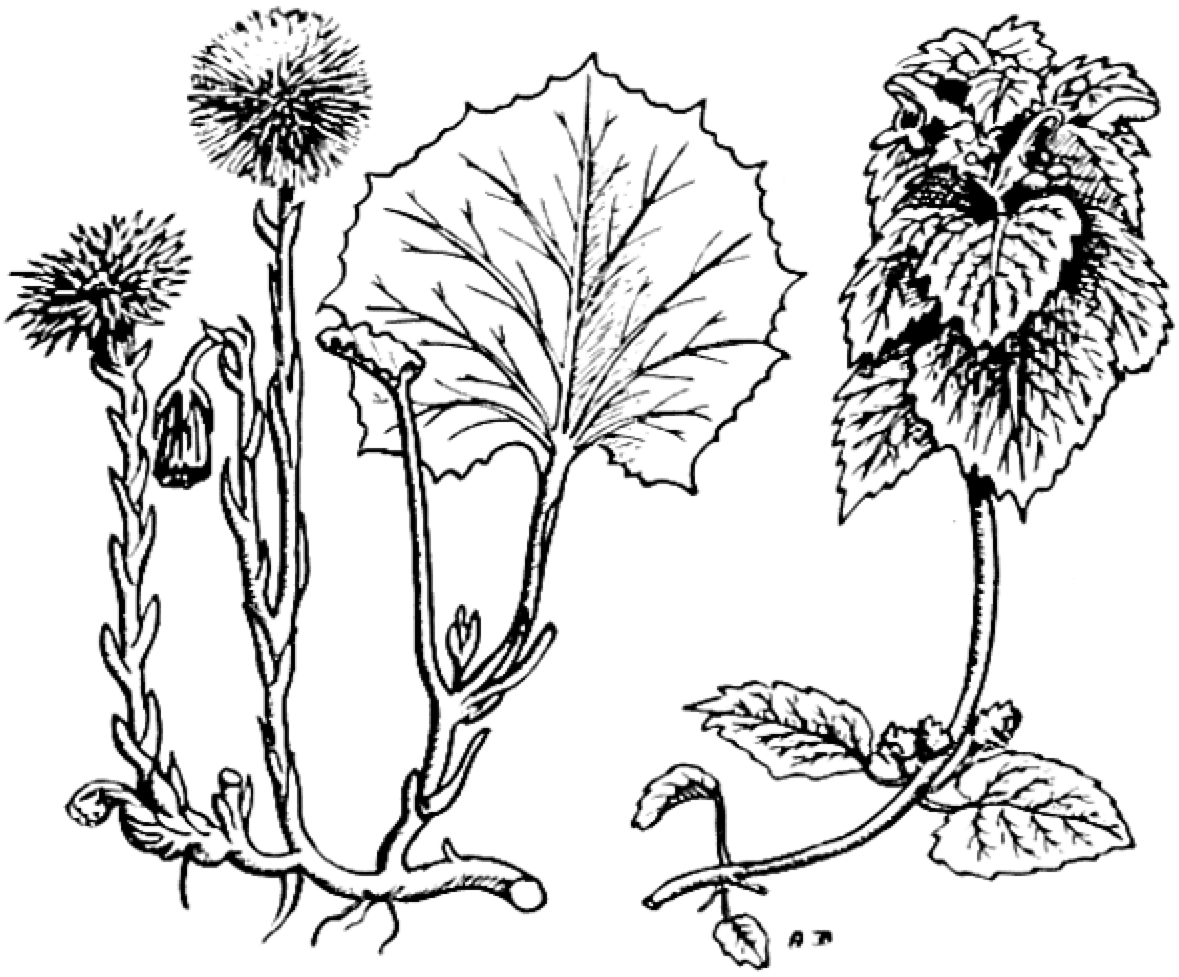
Change-about Farming

> Progress is marked not so much by the problems we are able to solve as by the questions we are enabled to ask.
>
> A. S. Eddington.

YOU ARE no doubt familiar with many of the fields in your district that 'come under the plough,' as the farmer says; and if you think of any one such field that you know well you will have noticed that it does not usually grow the same sort of crop year after year. It may grow corn one year, potatoes or mangolds the next, grass the next, and so on. This does not mean, of course, that the farmer grows different crops on his farm each year. Generally speaking he grows the same amount of each crop every summer; but not in the same fields. He alters his plan of cropping every season so that the crops grown in any one field come in a definite order as the years go by. Such an arrangement is called a *rotation* of crops. You should select a field on a farm near your home and try to find out—perhaps you will be able to remember?—what crops it has grown for the past three years and what crop it will grow this coming summer. You may wonder why the farmer goes to all this trouble, but the plough-land in Britain has been worked in some such way for many centuries, and it will be interesting to seek some of the reasons for this method of working. No farmer makes big changes like this 'just for the fun of it.' It would be much easier to grow the same crops year in year out on the same fields.

REASONS FOR CHANGE-ABOUT FARMING

(A) *Weed Killing.* Now we could go to the farmer and get all the reasons easily; but if we do some thinking we shall be able to find out some of them for ourselves. Let us think for a moment of what happens when the farmer grows 'roots' of some kind on one of his fields —turnips, or mangolds, or potatoes, for example. As you know, these crops are grown in widely spaced rows, so that a horse or tractor can take implements up and down the field without doing any damage even when the crops are half grown. This has the great advantage of allowing the farmer to use a hoe or a scuffle to destroy weeds, and as you have learnt, weeds are one of the farmer's greatest enemies, and he must take every possible opportunity of destroying them. When root crops—or *row crops*, as they are sometimes called—are growing, the farmer can go on killing weeds with his hoe right up to the end of May or even later on some farms, so that he is able by this means to reduce the number of weed seeds in the soil and leave it 'cleaner,' as he puts it. Indeed row crops are called 'cleaning crops' for this reason. Now think what would happen if he grew corn on the same field year after year. As the rows of corn are very much closer together it would not be possible to do such thorough hoeing, and if the farmer took his tackle on to a cornfield in May he would damage the crop and perhaps ruin it. You can easily see that if the farmer did grow corn on one field for many years the soil would become very 'dirty'—that is, full of weed seeds—and after a time the weeds would become so thick that they would tend to choke the crops. Here, then, is one good reason for changing the crops on each field: *an occasional crop of roots allows the farmer to destroy weeds.* You may well wonder what happened in the days before turnips, mangolds, potatoes, or any other row crops were grown on British farms? You learnt in the chapter about milk that these crops only began to be used about two hundred years ago. For many centuries the only crop grown in England was corn. How did the farmers of those days destroy weeds? An attempt was, of course, made, but the method was very wasteful of land: each field grew corn for two years, and in the third year it was ploughed up and left without a crop, so that the hot summer sun could bake the furrows. In this way many weeds were killed in a dry summer through lack of water. When a farmer does this he is said to 'bare



Two weeds that grow in the spring: coltsfoot and dead-nettle.

fallow' his land. It meant, of course, that a third of our plough-land lay idle every year. No wonder the coming of the turnip improved our farming! Not only did it bring winter food for the livestock, it also enabled us to use all our land for crops each year, at the same time giving an even better method for killing weeds. Here is a list of some of the common weeds that need to be destroyed in the spring:

Bindweed
Coltsfoot
Cornflower
Corn gromwell
Dead-nettle
Fat-hen
Groundsel
Hemp-nettle
Knotgrass
Redshank
 (or willow weed)
Sow thistle

(B). *Controlling the Pests and Diseases.* Your farmer's crops are threatened not only by weeds but by other enemies as well. All sorts of diseases, insects, and other tiny animals attack the growing plant, and sometimes a whole crop is lost. Indeed, about a hundred years ago, disaster came to the British Isles in the form of a disease called 'potato blight' which ruined the potato crop. There was famine that year, especially in Ireland where the people relied mainly on potatoes for their food.

Fortunately for the farmer many of these pests and diseases attack only a few kinds of crop, and not others. There is, for example, a tiny creature called the potato eelworm, that lives in the soil. This creature feeds on potatoes and nothing else, and it does very great damage. How does the farmer keep this pest under control? If he grows potatoes in the same field year after year the eelworm gets a good chance to increase its numbers as there is always plenty of food for it—and the soil becomes *infested* with the pest. If, however, he grows potatoes in that field only once in several years the eelworm dies out, as it cannot feed on such things as corn or turnips, or clover; and when potatoes come round to that part of the farm again the soil is clear of the trouble and the crop grows quite satisfactorily. This is only one example of a crop pest or disease. There are very many others, but it is a good illustration of the second main reason for rotations. You must bear in mind that if the farmer did not take these precautions he would be faced with great peril as the complete loss of a whole crop might easily ruin him. Nature makes us pay for our mistakes, and it is important not to take too many chances with growing things. Farming and gardening are much more skilful occupations than many people think; fortunately we are gaining more and more knowledge about these things, and most farmers will tell you that there is always something new to be learnt.

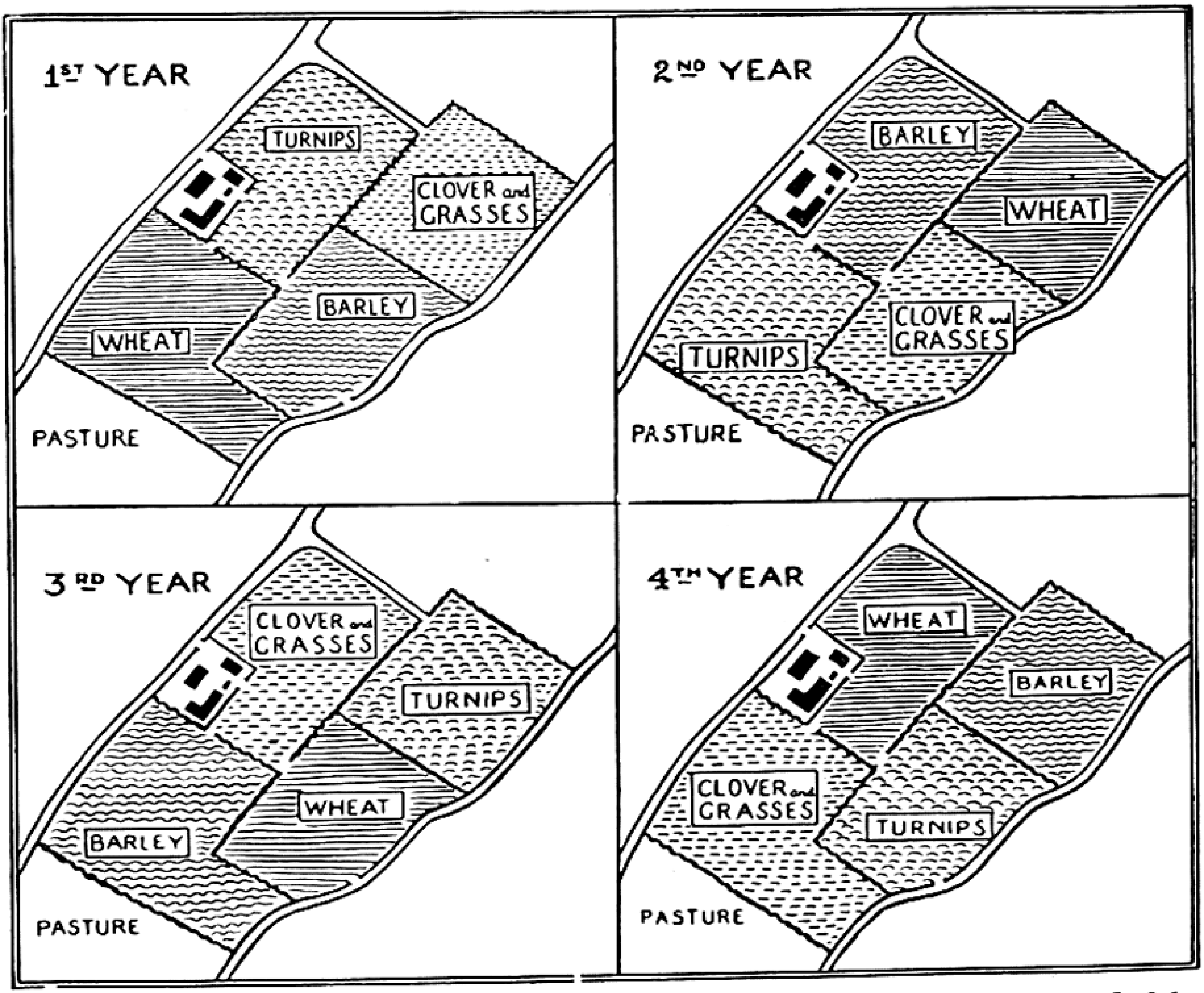
(c). *Keeping the Soil Rich.* In order to understand a third good reason for moving the crops about the farm we must think again about some of the things that the growing plant gets from the soil. Soil, as you know, can be enriched in plant foods by the addition of organic materials like farmyard manure. And you will remember also that well-rotted farmyard manure helps the soil to hold water like a sponge so that the plants do not suffer during a dry spell. Now these good effects do not last for ever. The growing crops use up the food substances, and sooner or later most of the manure disappears so that, if it is not replaced, the soil becomes poor. It loses its power to grow good crops, and more farmyard manure must be added. Unfortunately no farmer is able to provide enough manure to give a dressing to all his fields each year. It would be a very good thing if he could, of course. What he does is to manure each year those fields that are to grow row crops—such as potatoes or kale—as they are what he calls 'gross' or heavy feeders, and they need plenty of manure in the soil. If these crops were grown in the same fields year after year a large part of the land would never receive any manure at all, or very little, and so would become very poor or *infertile.* Notice, however, what happens when the farmer moves his crops about the fields. Once in every five years or so each field will grow a crop of roots and will therefore be manured. This ensures that all the plough-land on the farm will be kept 'in good heart' and rich enough to grow good crops.

There are other good reasons for working a rotation of crops, but you should remember these three at present:

(*a*) Control of weeds.
(*b*) Control of pests.
(*c*) Even distribution of farmyard manure.

HOW THE ROTATION WORKS

Each farmer follows the rotation that suits him best, and the result is that very few farmers use the same one. Everything depends on the size of the farm, the kind of soil, the particular crops the farmer wants to grow, and so on. He knows best what suits him, and



A simple crop rotation on four fields. Do any of these fields grow the same crop twice in four years?

after he has found a good system he is likely to keep to it year after year. You should find out the rotation followed by your nearest farmer. The way to write it down is to make a list of the crops grown in a particular field over a number of years. It might be something like this:

Roots
Barley
Seeds (meaning grass and clover)
Oats
Potatoes
Wheat

Let us examine the rotation used when turnips and clover began to be grown in Britain in the early part of the eighteenth century. It was called the Norfolk Four-course Rotation because it was first used in Norfolk by Viscount Townshend, and four different crops were grown. These were

Turnips
Barley
Clover
Wheat

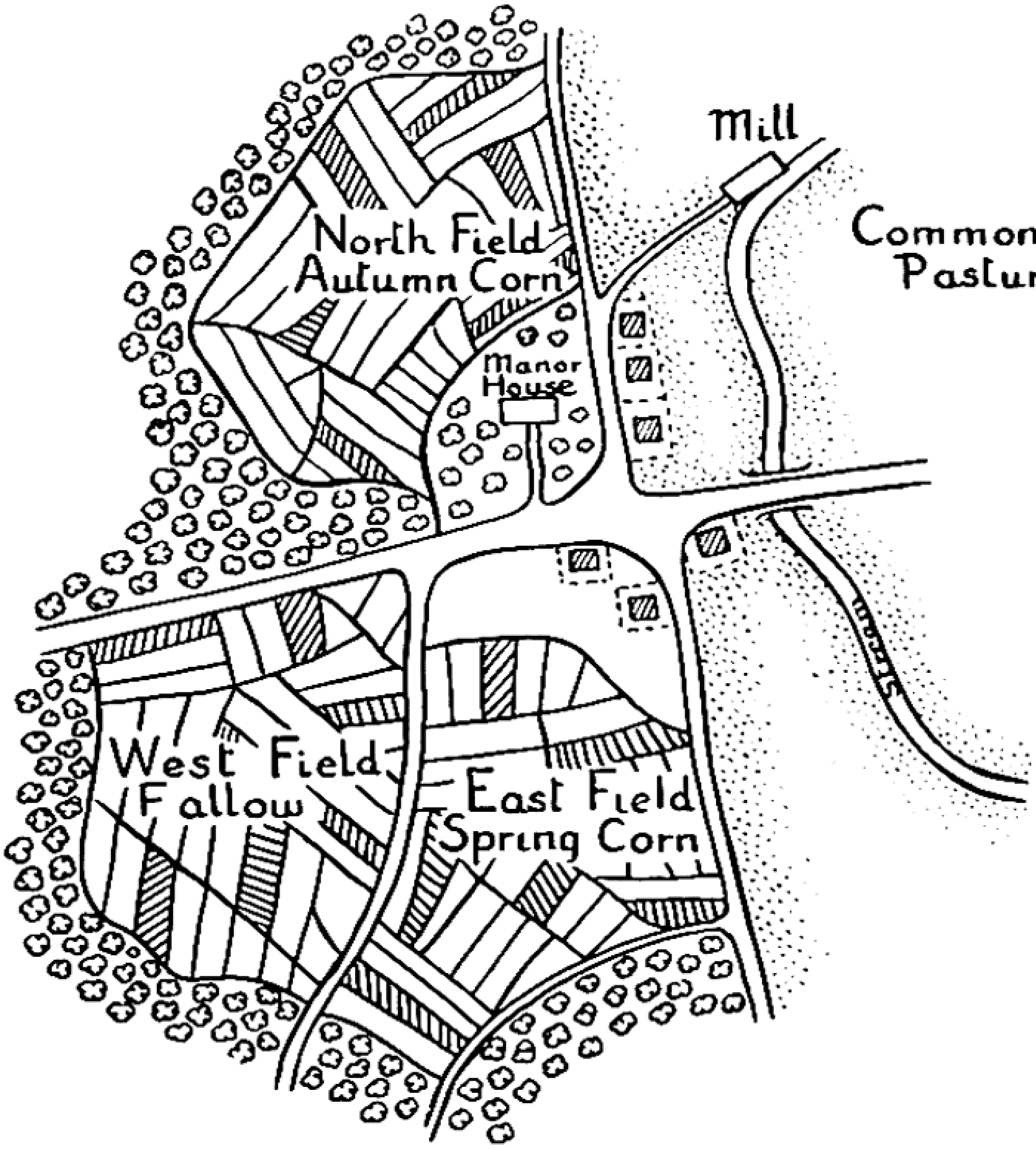
—and they always came in that order in each field so that the rotation started all over again every four years.

Suppose we imagine the farm to have had four equal fields. You will be able to see from the diagrams how the farm was cropped each year for the four years.

Up to the time when this kind of farming was adopted in Britain there were not very many fences —either walls or hedges--to be seen. Indeed the method of farming used before this time was called the Open-field System, and the corn was grown on great stretches of open land. The new method, however, made it necessary for the plough-land to be divided up into smaller fields so that the crops could be rotated properly; and it was at this time that most of the hedges and walls that we see about the country to-day began to be made. If any one who was living at the time of the Civil War in the middle of the seventeenth century, or at any time before that, could return to Britain at present, he would no doubt be astonished at the patchwork appearance of the countryside, and he would ask you why it had come about. You would be able to tell him that the growing of turnips and clover on a big scale had made it necessary, because with the coming of these crops a new system of rotation had come into being. Of course, all the fences were not put up at once; it took nearly a hundred years to complete the job, but by the time the Napoleonic War was over in 1815 (What was the name of the last battle?) nearly all the hedges and walls that we have to-day were in position. These hedges and walls not only served the purpose of dividing up the land into fields of suitable size and

Hedges give an attractive patchwork appearance to our countryside.

shape for the new system of rotations—they also prevented the cattle from wandering into fields where they were not wanted. A herd of cattle would soon 'make short work' of a field of turnips if they were allowed to get at them.



This ancient British farm was enclosed by forest, but there were no hedges round the huge fields.

The next time you take a ramble round the fields near your home try to imagine what the scene was like before the hedges came. It must have looked very different indeed. No wonder whole armies could be taken easily about the country in those distant days—there were few hedges to hinder either the soldiers or their horses, and such battles as those of Flodden and of Bosworth Field would be fought, not on one of the small fields such as we have to-day, but on one of the vast, open fields that were common in Britain before the new methods of farming began.

THINGS TO DO

(1) Write a short paragraph entitled: 'Three Reasons for Rotations.'

(2) Write a short paragraph entitled: 'Why the Walls and Hedges were put round our Fields.'

(3) Use single sentences to answer the following questions:

  (*a*) What are three of the crops that a farmer calls 'row crops.'
  (*b*) Why are row crops called cleaning crops?
  (*c*) What is the name of the crop disease that caused famine in Britain in 1845?
  (*d*) Why does not a farmer put farmyard manure on all his fields every year?
  (*e*) Why does a farmer put farmyard manure on his fields at all?
  (*f*) Why does he give his farmyard manure to the root crops?
  (*g*) In which century were most of our walls and hedges made?
  (*h*) What implement does the farmer use to destroy weeds in a field of roots?
  (*i*) What is the most common method of destroying weeds in the garden?
  (*j*) Why does not the farmer use this good method?

(4) Visit your farm and find out what crops grow on the plough-land. Find out the order in which they are grown, and so write down the rotation the farmer uses.

(5) Collect and draw five of the farm weeds that can best be destroyed in the spring.

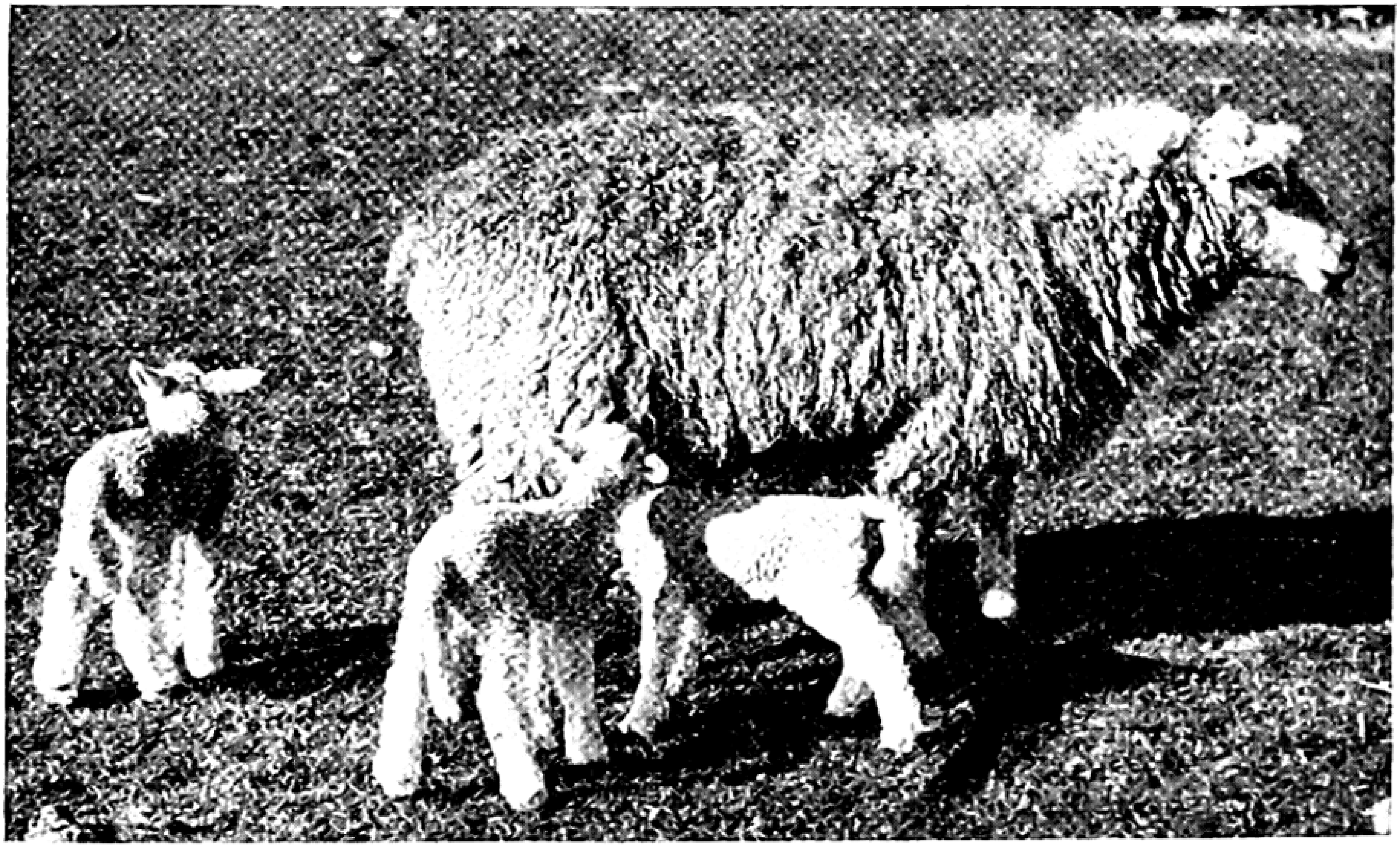
9

Spring Days in Farm Fields

'By sowing in wet, is little to get.'
OLD COUNTRY SAYING.

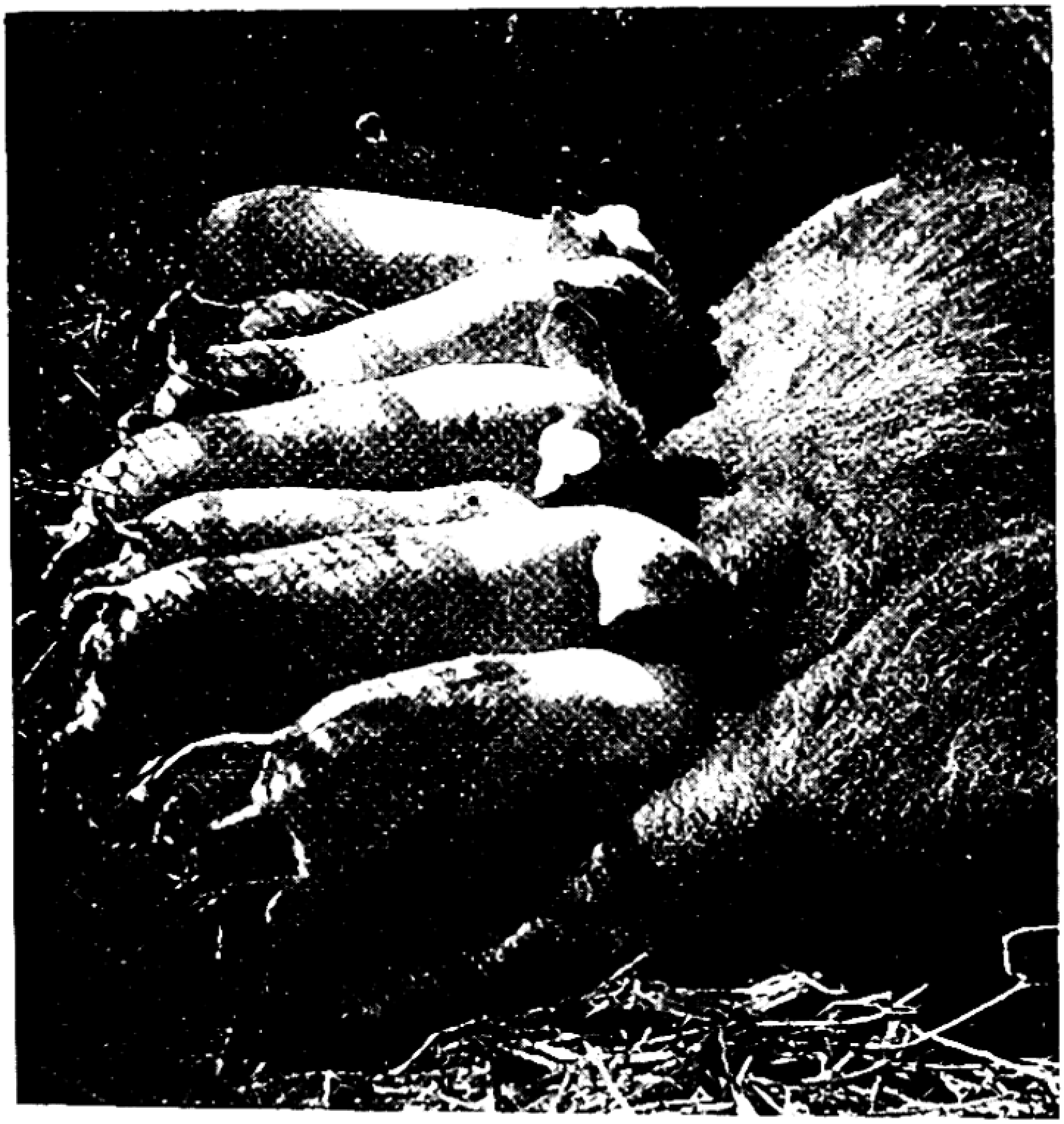
Spring, the sweet spring, is the year's pleasant king;
Then blooms each thing, then maids dance in a ring,
Cold doth not sting, the pretty birds do sing:
Cuckoo, jug-jug, pu-we, to-witta-woo!
THOMAS NASHE—an Elizabethan poet.

VERY early in the year nature begins all over again with her procession of flowers, and by the middle of March she has already begun to cast a thin green veil of young leaves over the woods and hedgerows. Everywhere there is evidence of new life and new activity—wood anemones and celandines are already in bloom along the woodside, the farmers are out on the plough-land again, and the springtime picture is completed by the lambs, most of which have now been born and are scampering in their mischievous way about the grasslands. Like most lively young creatures they are very attractive. Have you noticed their long legs? Lambs, and foals and calves as well, have very long legs in relation to their bodies. Perhaps that is what makes them look so pleasantly odd. Can you guess why the legs of these young animals should be so long? You will find that the young ones of all grazing animals are like this; and for a very good reason. In their natural state these grazing animals were always open to attack by the flesh-eating animals—largely the big cats such as tigers, leopards, lions, and so forth; and it was often necessary for them to move quickly into hiding. This would be impossible if the young were helpless like lion cubs or fox cubs; the mother needs to have babies that can walk or even run almost as soon as they are born, and she must also be able to suckle them while she is standing up. So nature comes to her assistance and the long legs of lambs, calves, and foals enable them to reach for milk even when the mother is busy grazing. When kittens or piglets are being suckled, the mother cat or sow lies down, but you will never see sheep or cows or mares suckling their young except when they are on all four feet. This feature of our grazing animals has been handed



Lambs are gay little creatures. Do you know why nature has given them such long legs?

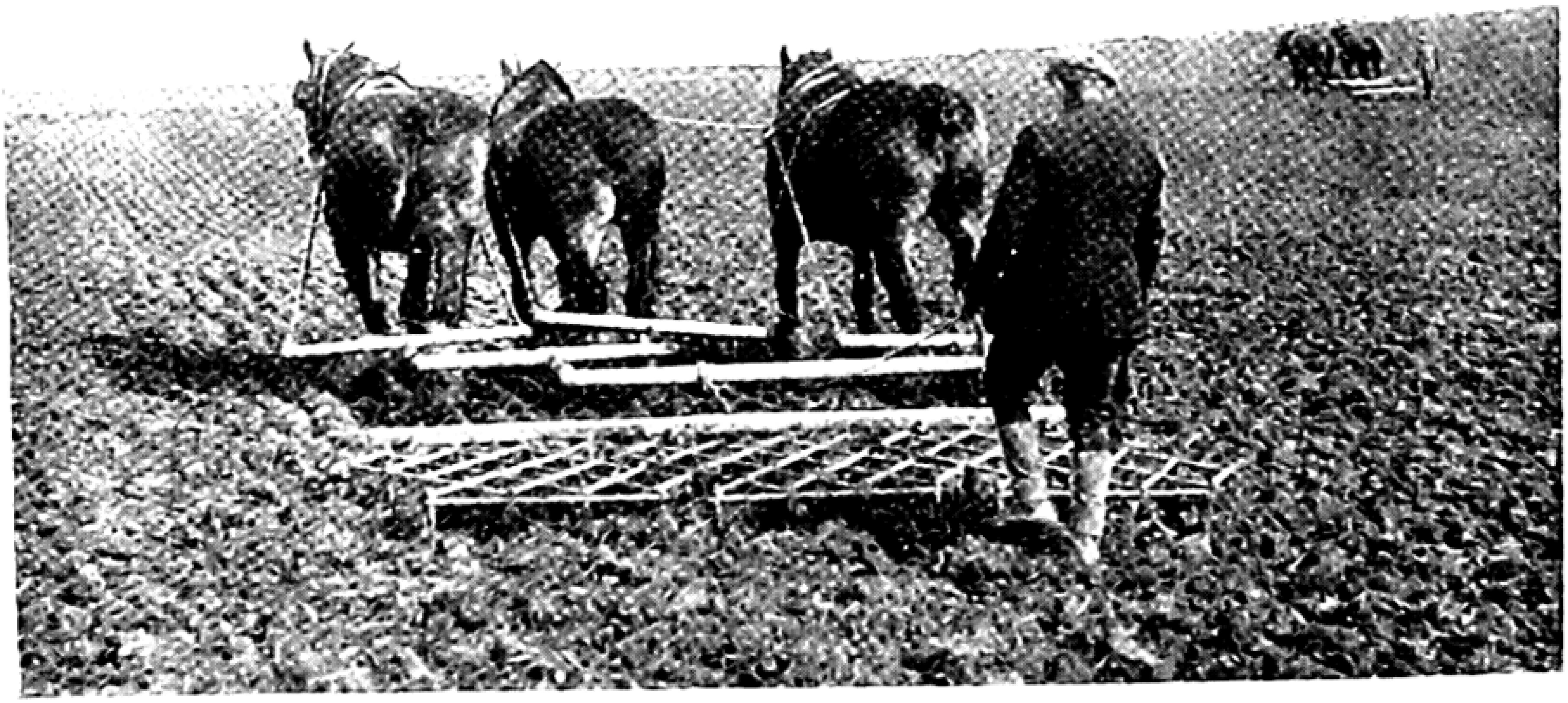
on to them from their wild ancestors. Remember this the next time you see a lamb wriggling its long tail as it noses after its mother's milk.



The sow always lies down when she is suckling her piglets.

BUSY DAYS IN THE FIELDS

As you ramble through the countryside on these spring days you will see the farmer at his busiest time. Throughout the winter the arable fields have not been touched at all. Those that we saw being sown with corn in the autumn are now green over with young plants, and most of the others that were ploughed in November or December have been left in rough furrows to sweeten and crumble under the action of the winter frost and rain. Winter frosts are a great help to the farmer. A good hard frost breaks up the heavy clods left by the plough and kills many



Why does the farmer use a harrow on his ploughland in the spring?

of the pests that may be living in the soil. It is in order to get the benefit of the frosts that the farmer ploughs his fields before the winter sets in. The plough lifts and turns the soil and exposes more of it to the action of the weather than if the field was left flat, so that when the dry March winds arrive the soil can easily be crumbled into a nice, fine seed-bed. Most seeds of farm crops are very tiny, and it would be no use sowing them among clods, as many of them would not get covered with soil at all and would either be eaten by birds or fail to grow. So the surface of the field has to be broken up into small crumbs of soil, and this fine 'tilth,' as it is called, needs to be two or three inches deep. How does the farmer set about making this seed-bed?

First of all he has to wait till the weather is fairly dry because wet soil sticks together too much. There is an old country saying that reminds us of this:

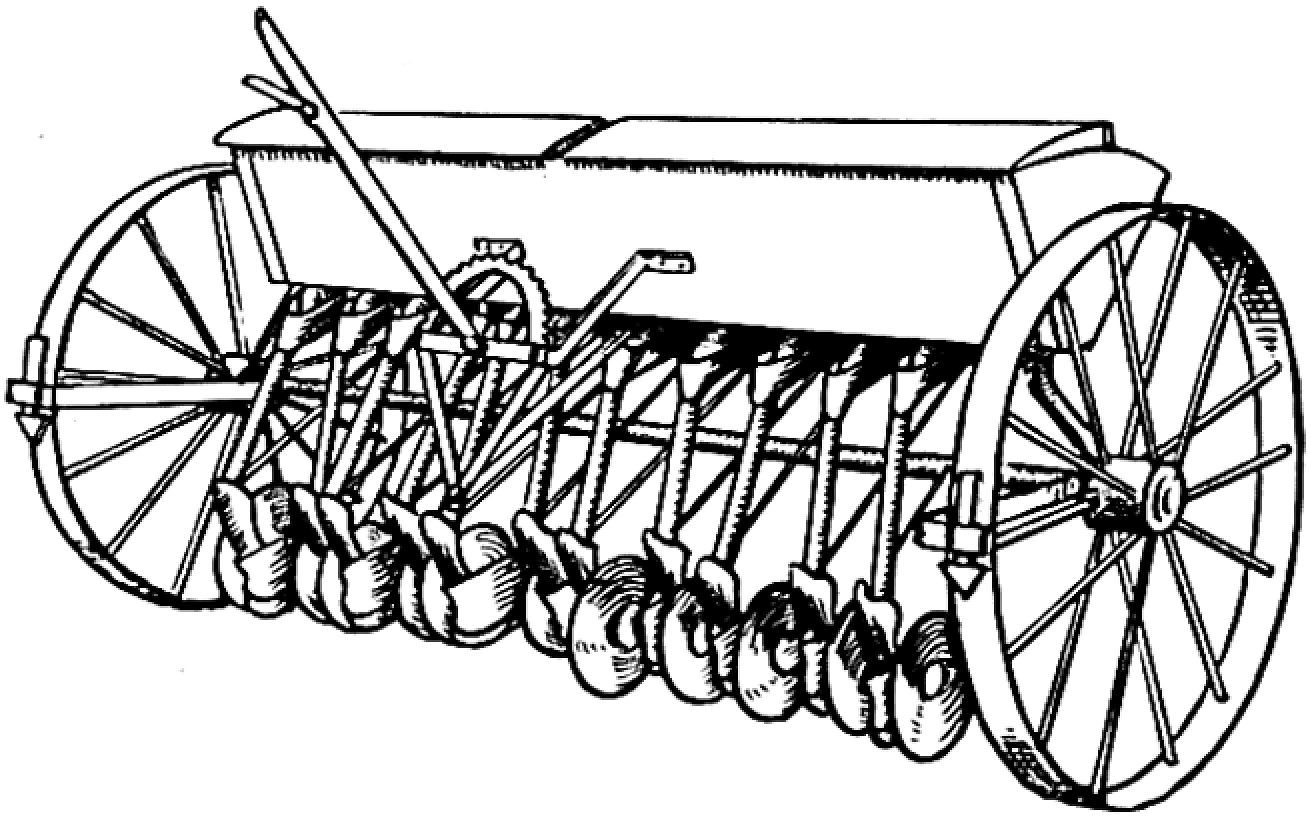
> A peck of March dust is worth a king's ransom.

and it expresses the great importance of having dry weather in early spring. When the soil is dry enough the farmer sets about the work of breaking it down, and you will see him going up and down the field with a large set of rakes called harrows. A horse can pull three of these as you see in the picture, but a tractor can deal with many more—up to nine, in fact. Very often you may see him breaking the soil with a roller as well, and he goes on using the roller and the harrow alternately until the soil is fine enough for the seeds to be sown.

SOWING THE SPRING CORN

If he has been lucky with the weather you will see the farmer sowing his wheat or oats or barley, some time about the middle of March (of course, if you live in the west or northerly parts of Britain the farmers in your district may have to wait a little longer than this), and for this he uses a special implement called a *seed-drill*. This is really a remarkable machine, and you should examine one carefully to see just how it works. As the drill is drawn across the field by the horse or tractor it makes a number of shallow grooves.

in the soil, and as it goes along it lays a trail of seeds in these grooves which are then automatically covered in, and the seed is sown! Before he begins work on the field the farmer fills a long box on the drill with seed, which falls on to the soil down long pipes such as you see in the picture. This machine was invented in the early part of the eighteenth century by a man named Jethro Tull, but it was a long time before farmers would use it. They preferred to go on using the age-old method of sowing, which was to scatter or broadcast the seed by hand and cover it with a harrow. Sometimes, on very small farms, this method is still used, but you will readily guess that it is very wasteful because a lot of the seed never gets covered and is eaten by birds. It seems that they expected to lose most of their seed in those days because an old country saying tells the farmer to



The seed-drill was invented by Jethro Tull.

Sow four grains in a row,
One for the pigeon, one for the crow,
One to rot and one to grow.

That meant that only a quarter of the seed ever came up! Of course, some of the grain that the farmer sows to-day is taken by birds, mostly rooks and pigeons. Wood-pigeons *are* without doubt very troublesome pests indeed, but although rooks do take seeds from the soil, they take many other things as well—wireworms and leatherjackets, for example—and many farmers think that they do more good than harm. Perhaps it is a mistake to shoot them after all!

Before we pass on, and while we are thinking of Jethro Tull and his seed-drill, let us pause to remind ourselves of the many improvements in farming that began some two hundred years ago. It seems that the new ideas and changes began to come all at once. Things often happen like that in the history of people's affairs. Life goes on in the same old way for a long long time, and then suddenly many changes take place, and a new way of living begins. That is what happened to farming. Sudden changes, of course, are usually troublesome, and we are told that Jethro Tull's new idea for sowing seed was so disliked by his workmen that they actually attacked him one day and gave him a good kicking! We know now who was right, of course. You may be interested to know also that Jethro was a very clever organist, and that it was, so he said, the pipes of the organ that gave him the idea for his drill. And indeed the pipes of a modern drill do look rather like organ pipes!

As soon as his spring corn has been drilled the farmer takes a look at the corn that he sowed in the autumn, and which is now growing away quite happily. When he can afford the time he will take a roller and a harrow over the young crops too if the soil is quite dry. That may surprise you when you see it, and you may well think that it would spoil the crop. It is quite necessary, however. The harrow tears out many of the young weeds that are beginning to grow and the roller presses the soil firmly round the roots of the young corn plants. Another important reason for taking the roller over these fields is that any stones or big clods that have been left on top of the soil by the winter rains and frost are pressed into the ground. You may wonder why this is necessary, and to find the answer you will have to think of what happens at harvest time. The crop will be cut by the knives of a reaper, and as these knives work very close to the ground they would be damaged by any big stones or clods that were standing above the surface of the soil. In order to prevent this the farmer goes over the field with his roller while the crop is

This farmer at Hinton Green on the Cotswold Hills is harrowing his young corn.

still young, and so makes the surface quite level. This is a very good example of the way in which the farmer has to think ahead all the time. He must not be caught 'napping' as we say.

THE ROOT CROPS

By the end of March much of the plough-land will have been sown, but there are still some fields that have not yet been touched. Can you think what these fields will grow? Most of the row crops—turnips, mangolds, sugar-beet, kale—can be sown later than the corn, as they go on growing well into the autumn. And, indeed, the potatoes have to be planted later than March because of the risk of frost. It suits the farmer very well to be able to wait until April—or even May—to sow his roots and plant his potatoes, and when all the corn has been drilled he has time to turn his attention to them. The process is very similar to what the farmer used for the corn, except that the seeds are sown in much wider rows; and the same implements are used to make the seed-bed. Many farmers use the same drill for roots as they do for corn; but sometimes a smaller root-drill is used. There is one very important difference between the sowing of corn and the sowing of root seeds. If you can get the farmer to let you examine some seeds of turnips or kale you will see how very tiny they are; and because of this it is necessary to sow them in slightly damp soil. When you were watching the sowing of the corn you would see the clouds of dust that came up as the drill passed along. But you will never see that dust cloud when row crops are being drilled. The farmer always waits until there has been some rain, and he generally goes over the field with a roller after the seed has been sown. This presses the soil firmly round the tiny seeds and keeps them moist. You may think that the seeds of mangolds and sugar-beet do not look very tiny, but the so-called 'seed' is really the fruit, and the real seeds which are very small indeed are inside this fruit. As you watch the root crops being sown remember that, except for sugar-beet, they are intended for stock food in the following winter.

The potato 'seed' (which is not a seed at all—can you say why?), is put in by hand as a general rule. You will see the farmer putting his field into ridges by means of a special plough. The potato 'setts' are placed along the bottom of these ridges, and then the ridging plough comes along again and covers them. Do you remember how clever one of the horses has to be? If you have forgotten turn back to page 70 and refresh your memory—and then try to see a horse at work on this job. It is something that you will not easily forget once you have seen it. Seeing is not only believing, it is remembering too, and you should always go into the fields after reading this book and try to see the various things for yourself.

THINGS TO DO

(1) Write a short paragraph entitled: 'Why lambs have long legs.'

(2) Write single sentences in answer to the following questions:

  (*a*) Which farm animal normally suckles its young when lying down?

(*b*) Which farm animals suckle their young while standing up?

(*c*) Why does a farmer plough most of his fields before the winter?

(*d*) Why does the farmer wait for dry weather before preparing a seed-bed for his crops?

(*e*) What did Jethro Tull invent and when did he invent it?

(*f*) What weight of seed does your farmer friend use for an acre when he is sowing oats, wheat, or barley in spring?

(*g*) Why does the farmer take a roller over his winter wheat in spring?

(*h*) Why does the farmer sow his row crops in a moist seed-bed?

(*i*) Can you say why the potato 'seed' is not a real seed?

(*j*) Why must the farmer wait until mid-April before planting his potatoes?

(3) Make a list of the changes for the better that began in British farming about two hundred years ago.

Example: (i) Robert Bakewell and others began to breed better cows and horses.

(4) Now is the time to sow the seeds of wild plants that you collected in the autumn. Select a suitable place in the garden or in a low hedgerow, and make a seed-bed first. Wait until there has been a shower of rain before you sow and put the seeds very near the surface. Take care to mark or remember the patches where you put the various kinds of seed.

(5) Make a neat drawing of a harrow section, being sure to get the number of teeth right.

(6) Find out from your farmer the number of acres of the various crops he is growing on his farm this year. Write the answers down like this:

1. Oats—14 acres. And so on.

10

Wild Life of Wood and Field

And the blessed green comely meadows are all a-ripple with mirth
At the noise of the lambs at play, and the dear wild cry of the birds.
JOHN MASEFIELD.

YOU have now learnt enough to know that if a boy who lived in your part of the country in Roman or Saxon times could accompany you on your favourite walk most of what you showed him would be different from what he remembered seeing on his country rambles. The cows, the sheep, the horses, many of the trees, the crops, the fields, and the farmer's way of working would all appear so strange to him that he might easily think he was in a foreign country. But *some* of the things would be just the same as they have always been, and when he saw *them* he would begin to feel much more at home. Can you think of any such things?—country things that have not been changed by men, and that are the same to-day as they were centuries ago, even in the times of the Ancient Britons? Can you imagine your young friend's delight on finding some familiar wild flower like a celandine or primrose or buttercup? And however altered in appearance the *farm* animals may seem to him he would certainly be pleased to recognize the red squirrel or the wild duck or any other of our wild creatures. He would begin to feel much more at home among these wild things as *they* have not changed at all. Man has left them alone, and wild nature is very slow indeed to make changes on her own account. Most of our garden flowers, and most of the crops and animals on our farms, came in the first place from other countries, but most of our wild plants and creatures have been in this country as long as men can remember. Perhaps they were here before there were any men at all. These wild plants and animals may be useless as food, or harmful to the crops—think of weeds and wood-pigeons!—but the countryside would be very much less beautiful and less interesting without them. A country walk would be very dull indeed if we never saw a thrush, or picked a bunch of bluebells, or heard the sweet song of the lark. The food and clothing that we get from farms is very necessary to us indeed, and we could certainly go on living without the wild creatures or the wayside flowers. But then some of the best things in our lives are not really necessary in that sense—think of music and Christmas cards and beautiful paintings. We should be much worse off if we did not have any of these things: they are, perhaps, given to us as extras to enjoy if we can. And that is the way in which we must regard wild flowers and the creatures of woodland and hedgerow. They have their own lives to live; and in their way they are probably as important to themselves and to God as we are. Here is a description of the country that has nothing whatever to do with food—the writer was clearly able to enjoy the sights and sounds of the country just for their own sake:

> To hear the lark begin his flight,
> And singing startle the dull night,
> From his watchtower in the skies,
> Till the dappled dawn doth rise;

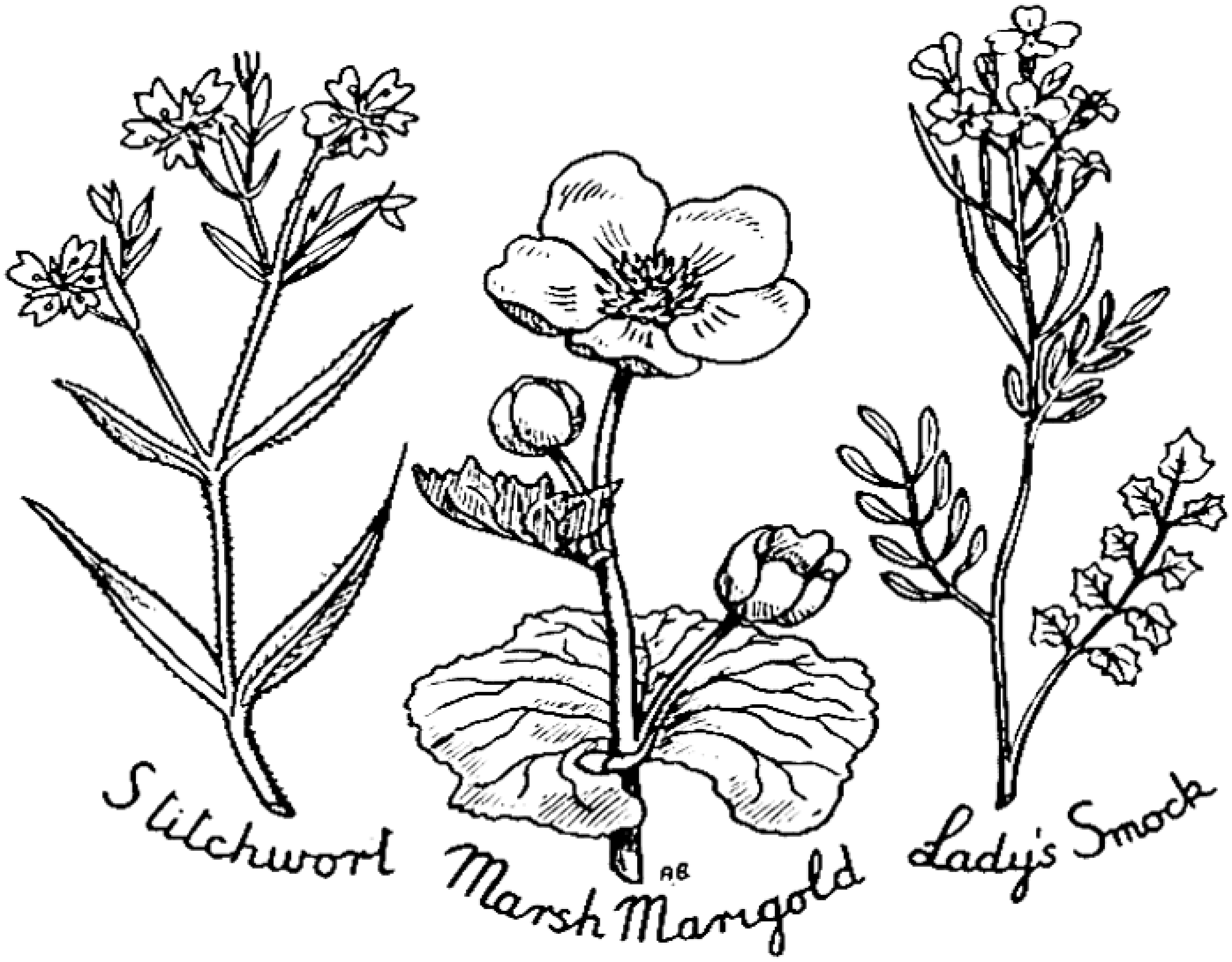
Then to come in spite of sorrow,
And at my window bid good-morrow,
Through the sweet-briar, or the vine,
Or the twisted eglantine.
While the cock with lively din,
Scatters the rear of darkness thin,
And to the stack, or the barn door,
Stoutly struts his dames before.

That lovely and cheerful description of early morning in the country was written by the poet John Milton about three hundred years ago. It is part of one of the most beautiful poems in our language, and you should learn it by heart. Cheerfulness is just as important as food; we must have both. So let us learn to look at wild nature with a cheerful and a grateful eye!

ABOUT WILD FLOWERS

We can learn quite a good deal about some wild flowers from their names. Think of as many flower names as you can that contain the word 'lady.' There are Lady's smock, Lady's mantle, Lady's finger (a kind of clover), Lady's tresses (a kind of wild orchid), and Lady's bedstraw. Can you think who this lady was? It was the Virgin Mary, mother of Jesus; and these flowers were named after her by the country people of far-off days. There is one common wild flower that has the word Mary in its name; that is the marsh marigold, which really means Mary's gold. We can tell that these names are ancient because, of course, England must have been a Roman Catholic country when they were first used, and that was before the time of Henry VIII, who reigned in the sixteenth century. It was not until his time that the religion began to be changed. Who would have thought of reading history in the names of wild flowers? Let us examine some more.

In olden times there were few doctors, and even these were not very skilled. Most people who became ill had to get better again without the help of a doctor, and many wild plants were used as medicines. Different plants were found to be useful for different diseases, and even to-day many of our wild flowers have names that were given to them by country people who, centuries ago, used them in times of illness. Here are some clear examples, try to find these plants in the fields: *fever*few, *wound*wort, *stitch*wort, *eye*bright, *self*-heal, *pile*wort, *gout*-weed, and *nipple*wort. These flowers were named long before there were many doctors. Of course, many plants were used as



Do you know how these wild flowers got their names?

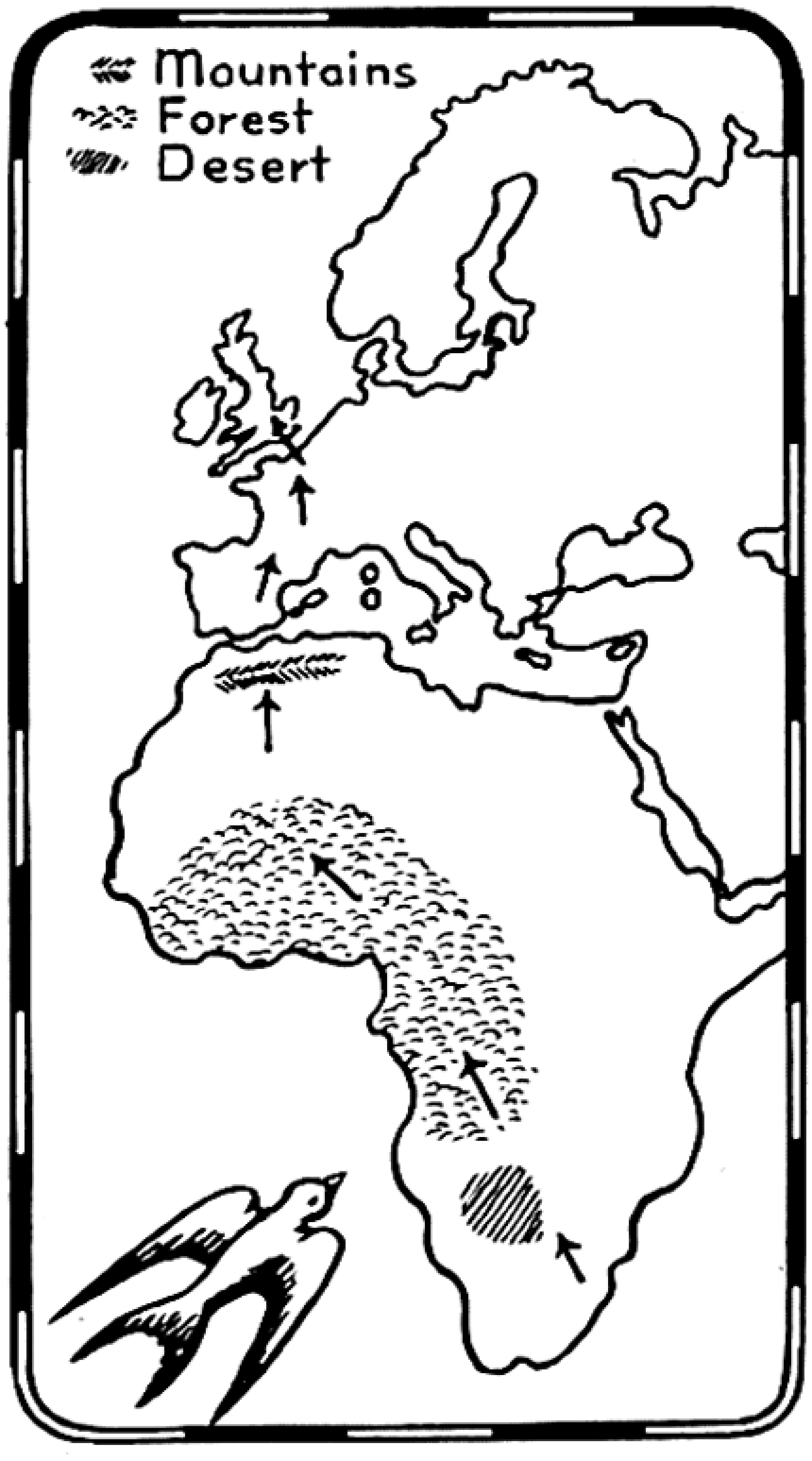
medicines without being named after the disease they cured. Even to-day wild herbs, as these *medicinal* plants are called, are used to help in the cure of all sorts of ailments, and very valuable they are. You should try to find out whether any people near to where you live gather or grow herbs as medicines. It is clear from these names that nature and the wild hedgerow provided the chemist's shop in former days! And there was no charge!

Do you know the scarlet pimpernel—a small, but very beautiful flower that may often be seen growing low down among the corn? The other name for it is poor man's weather-glass. Can you think why this should be? A weather-glass is the name given to an instrument called a barometer. It is a long glass tube filled with liquid called mercury, and it is often possible to tell from this what sort of weather is ahead. That is why it is called a weather-glass. The scarlet pimpernel can be used in a similar way. Sometimes the tiny, five-pointed star of the flower is open wide. This is usually a sign of good weather. However, there are times—even in the middle of the day—when the pimpernel closes up into a tight bud. This is very often a sign of rain. So you see it can be looked upon as a kind of weather-glass, and as it costs no money people have called it the poor man's weather-glass. If you can find one growing watch its behaviour for a few days and see whether it gives a reliable forecast. You will remember that the purpose of all flowers in their natural state is to produce fruit and seeds. While you are examining the scarlet pimpernel you should take care to look at the fruit which is very unusual. You will need a magnifying glass to see it clearly as it is quite small. The outer covering is a little green ball about as big as your little finger nail. The top half of this will pull off and it comes away as cleanly as if it had been cut with a tiny knife. It looks rather like a little hat with a bob on it. You will see the seeds in the bottom half, and they are packed together like honeycomb cells. Every bit of space is filled, and you will wonder how nature manages to arrange them so neatly.

As you go about the fields try to find the fruits of other small flowers. They are not so easy to find as the larger fruits like acorns and so on, but they often appear in the early summer, and your search will remind you of nature's reason for producing flowers at all. Remember—every flower has a fruit of some kind.

BIRDS OF THE WILD AND HOW TO WATCH THEM

Perhaps you already know something about birds, and maybe you have collected some of their eggs. There is no great harm in egg collecting, so long as you do not take the eggs of the rarer birds, and always take care to leave at least three eggs in the nest. Of course, it is possible to scare the birds from the nest altogether, and if you think of it from the bird's point of view it is perhaps better to take more interest in the birds themselves and leave the eggs to their rightful owners. If you do become interested in the way birds behave, and if you try to learn the calls of birds so that you can give the songster a name without seeing it, you will have started a hobby that will last you all your life. Nobody that gets a real interest in our wild birds ever becomes tired of his hobby. It is quite thrilling too; you have to learn how to be a hunter, because birds are often very timid, wary creatures, and it is quite an achievement to get near to one without scaring it away. And when you get older you can build small tents and other such hiding-places near to the nests, and so get near enough to the birds to watch them at work hatching their eggs and feeding their young. If ever you get this kind of an interest in birds you will not bother with the eggs; you will be far too interested in watching the creatures themselves.



Nobody knows how migrant birds like this swallow find their way across the world.

And birds really are very wonderful indeed. Let us think for a few minutes of the many kinds that leave our country each year for foreign lands. There are about forty different kinds that do this—the nightingale, swallow, tree pipit, flycatcher, whitethroat, garden warbler, turtle-dove, and cuckoo are examples of only a few of the birds that come to us in spring and go away again in the autumn. These birds, many of them quite tiny—no bigger than a baby's fist—travel thousands of miles each year. Why do they move about the world like this? Nobody can give the complete answer. But there is an even greater mystery. How do they find their way across such great distances? If you or I tried to do it we should surely get lost. Even the most modern aeroplane has to have all kinds of instruments to help it fly safely from one place to another; but the birds do it without any instruments or compasses at all. Sometimes a bird will come right back to the very barn or hedgerow in which it nested the year before. Think of that! A journey of many thousands of miles across Africa, over the jungle, and over the Atlas Mountains, across the Mediterranean Sea, through Spain and across France, over the English Channel into England —and then on across the woods and fields of countless farms to the very spot where it lived last year. A small creature—not as heavy as the book you are reading—and yet it is capable of an adventure such as few men would attempt. As you watch the swallow and martins round your home to-day try to think of even a few of the things that they saw only a few weeks ago when they were returning to their birth place. Racing pigeons are wonderful birds, but they have to be trained to travel even a few hundred miles. Our wild *migrant* birds travel very much further without any training at all, and much of the flying is done at night. This is one of the great wonders and mysteries of nature. Not very long ago a female shearwater (the shearwater is a sea bird with webbed feet) was taken from its nesting hole in South Wales and taken to Italy—a country to which British shearwaters never go. A marked ring was placed round one of its legs and it was released. *A fortnight later it was back at the nesting hole!* It had found its way across country or along coasts that it had never seen before. So you see a good deal more can go on in the life and mind of a bird than we imagine—and there is much for us to see and think about.

I want to tell you some of the things you should do if you would like to start this hobby. First of all you need a book that contains good pictures of British birds. One of the best and one that will last you for a long time is called *The Observer's Book of British Birds*, and it costs 5*s*. Perhaps someone will give it to you at Christmas or on your birthday. It is important for you to have something of the sort, and you should spend a long time when you are alone looking at these pictures so that you really get to know what the different birds look like. This is a great aid in helping you to recognize birds that you see. The same method of learning was used in the Royal Air Force during the war. The men were shown many pictures of all kinds of aircraft, and they had to be able to name them all. The result was that when they saw any aeroplane in the sky they were able to recognize it at once. The more you look at your book the more birds you will be able to name as you keep careful watch on your rambles. No one can do this for you. You have to do it for yourself, and that is why it is such a thrill when you do see a bird for the first time.

And now for the way you should behave when you are out stalking birds. Remember that the birds usually see you before you see them. They are much more alert than we are. But they will not move away unless they think you have seen them. So do not ever point at a bird. Avoid loud talking, tread quietly, and take as much cover as you can. If you happen to be in the open when you see a bird do not stop suddenly. That is sure to scare most birds away. Keep on walking and if you come to a standstill do so slowly. Jerky and sudden movements always make birds suspicious of you. When you have had a good look at your bird begin to move slowly near. Just a yard or two at a time. It is surprising how close you can get in this way if you are a good stalker.

If you move quietly about the fields you will see many birds.

You must not be disappointed if you do not find many new sorts at first. They are there all right, but you need practice and you must persevere. Some of the best bird-watchers had poor results to begin with. It is better to be a slow starter in most things, and not to be *too* lively and keen about it. You get further in the long run.

Whenever you see a fresh bird make a short note of it. The best place for this is on the page in your book that describes the bird. All you need do is to note the date and where you saw the bird. Make a note also of your companions' names. This collection becomes quite exciting as it grows and will be a treasure to you later. Of course, you must *never* enter a bird as seen unless you are quite certain about it. You would not value your collection of successes if you did. One of the chief values of this hobby is that you can follow it up wherever you go to—there are always birds to be seen.

Perhaps the best time for you to make a start is in spring, especially in later April or May. The birds are very numerous and lively at that time of the year, and most of the summer visitors have returned. The worst time to start is in August. The parent birds are tired after their job of bringing up the young ones, and are usually quiet and not very active. There are plenty of birds about, of course, but those you see will be mainly the young ones, and their feathers will not yet be showing the true colours so that they are difficult to recognize.

You will learn more about birds later on, and you will learn how to make a simple hide. Make good use of this year's birds and learn to recognize at least thirty, so that you will be able to profit from next year's lessons. And when you are watching any bird try to find out just what it is doing, and remember that the same kind of bird was to be seen in Britain even before the time of the Romans.

THINGS TO DO

(1) Imagine you are a bird returning from Egypt in the spring through Greece, Italy, over the Alps, across France, and so to England. Write a composition describing your journey. Do not forget to mention things like weather, day and night, other birds, your food and speed, as well as the things you see. Make it sound true.

(2) Write single sentences in answer to the following questions:

- (*a*) After whom was the marsh marigold named?
- (*b*) Who do you think gave the common names to our wild flowers?
- (*c*) There is a plant called woundwort. Why is it so named?
- (*d*) Why does nature grow the flowers on plants?
- (*e*) What is a migrant bird?
- (*f*) What difference do you think the planting of hedges made to the number of birds in England?
- (*g*) Can you think of *one* possible reason why some birds migrate?
- (*h*) Can you think why birds have hollow bones?
- (*i*) Can you think of a wild bird whose young ones can run about as soon as they are hatched?

(3) Make a list of the birds you have seen in your district.

(4) Collect one of each of all the wild flowers in bloom in your district and bring them to school. The whole class should get at least fifty. They should be neatly labelled with their names and the exact position in which they were found.

(5) Make a list of the medicinal plants to be found in your district. Say what each may be useful for.

Example: Comfrey: making a poultice for wounds.

(6) Make a neat drawing to show the difference between a song-thrush and a blackbird.

II

Small Livestock on the Farm

> My grottoes are shaded with trees,
> And my hills are white over with sheep.
>
> WILLIAM SHENSTONE.

> . . . the lambs were merry curly-haired little rogues, with twinkling eyes and black, sturdy legs.
>
> ALISON UTTLEY in *The Country Child*.

SHEEP

WHEREVER you go in Britain you will find sheep of some sort. Not on every farm, of course, but it would be hard to go a day's journey without seeing a flock of sheep of one sort or another—black-faced, white-faced, with horns, without horns, mountain sheep, lowland sheep. There are nearly 20,000,000 in England and Wales alone, to say nothing of those in Scotland. Remember that in the Middle Ages sheep were kept for their milk as well as for their wool and meat. Can you remember the reason? Nowadays sheep are kept in Britain mostly for the mutton we get from them. The wool is used also, of course, but most of our wool comes to us from abroad, largely from Australia. Three or four hundred years ago the big farms in England had many more sheep than we have to-day and for several centuries, wool was even more important to the farmers than mutton because they were able to sell it for a good price in Flanders. The owners of some of the big farms became very wealthy indeed from the wool they sold and those parts of England where the wool farming was mostly done were very prosperous, and had fine buildings and beautiful churches as a result. If you live in Norfolk or in the Cotswold country you will be able to see some of the fine towns and churches that were built out of the money that wool brought into England from other countries. The very best sheep for wool are what are called lowland breeds. That means that they flourish quite well in the lowland counties, but are not hardy enough to thrive in the mountains, where the weather is much colder and wetter and the food poorer. We still have lowland sheep, but not in such great numbers as formerly. They cost a lot more to keep than do mountain sheep because they need a shepherd with them much of the time. When cheaper wool began to come to us from Australia we could not afford to keep so many lowland sheep for wool.

The mountain sheep, however, are still very valuable to us because they can live quite easily in those hilly parts of the country that are no use for anything else. Up in the hills, especially above about 1,200 feet, it is too cold and wet for crops, and only the poorest grasses will grow so that there is no grazing for cows. Mountain sheep, however, can live in the hills all the year round, and they are so hardy that they do quite well on the mountain food which consists mostly of sparse grass and the young shoots of wild plants like heather and gorse. Have you noticed that in the autumn the hill farmer will sometimes set on fire a whole hillside of heather? This is so that new young shoots will grow for the sheep in spring.

A shepherd is very necessary in the hills for lambing, or dipping, or shearing, but he can look after many more sheep than a lowland shepherd, so that mountain sheep are not so costly to keep in that way either. In very hard winters, when there are heavy falls of snow, they do require more attention as the grass and heather get covered up and the sheep themselves quite easily get lost in snowdrifts. At such times the hill farmer has to work very hard indeed with his sheep and often rounds them up and brings them to lower ground; sometimes the weather beats him and his men—and hundreds of his sheep starve to death for want of food and shelter. Such disasters occur very infrequently, however, and generally speaking the mountain sheep fend for themselves throughout most of the year.

No shepherd could work without his dog.

No shepherd could work without his dog. This is true of lowland shepherds, but a dog is even more necessary in the hills. Sometimes the shepherd will have two dogs that work together, and very intelligent they are. They know the shepherd's every sign, and they know exactly what he means by the movement of even a finger or the sound of his whistling. Shepherd and dog think together with perfect understanding, and few things are more exciting to watch than the two of them at work. You may see the dog, still as a statue, watching his master's hand with unswerving attention. It is as though the bright eye said: 'I know that you are working something out, Master, and in a minute you will need me. When you do you will flick the finger of that hand I am watching; and then I shall go like lightning to help you.' If ever you get the chance of seeing a sheepdog trial be sure to make use of the opportunity. You will learn there that dogs can think, and that there is nothing they love more than helping a good master. The shepherd does not move about a great deal when he is working the flock with his dog. He decides what is wanted, and the dog races off to do it. Sometimes the dog will separate one or two sheep from a whole flock, and bring them into the fold. How the dog knows which particular sheep his master wants is a mystery that you might like to solve for yourself as you watch them at work.

Perhaps the most attractive and picturesque part of the year among sheep for the onlooker is the lambing season. But, for the shepherd, it is the busiest time of all, and may give him a great deal of anxiety. The baby lambs are arriving day and night, and in a big flock there may be as many as forty or fifty new lambs a day. The shepherd needs to go round his flock every day for several weeks. Most of the lambs are all right, of course, and are well looked after by their mothers. But sometimes a ewe (the mother sheep) whose own lamb has died has to be persuaded to suckle some other lamb—one of a pair of twins maybe. This is often quite a task, as she wants her own lamb, not someone else's. As often as not the shepherd has to put the skin of the dead lamb on the back of the little stranger, and this usually does the trick. The sheep can recognize the smell of her own lamb's wool and thinks her baby has returned. There is no trouble with suckling after that. In other cases it may be that the mother has not enough milk to feed her lamb, and the shepherd has to take it down to the farm and feed it from a bottle. There is no end to his work at this time. All sorts of enemies threaten the lives of the lambs. The carrion crow (not the rook!) and its near relative, the hooded crow, will attack and kill young lambs, so these birds have to be shot. The next time you enjoy watching the playfulness of the lambs remember the hard work, in all weathers, that the shepherd has had to do for many of them.

Do not imagine that the hawks do any damage to lambs—with the exception of the eagle which will, of course, pick up a young lamb and carry it alive to its nest in the rocks; most hawks are very useful to the farmer, and destroy things like mice in large numbers. The sparrow-hawk, however, does damage to poultry and chickens as well and this bird needs watching.

PIGS

Both cattle and sheep live mostly on grass, especially in the summer, and they both chew the cud. Their ancestors lived on open grasslands day and night, winter and summer, so that the farmer can keep his cows and sheep in the open for most of the year. Indeed he never needs to bring his sheep inside at all. But the pig is a different sort of animal altogether. It is not covered with hair to keep it warm in cold weather, and it cannot sweat to keep cool in hot weather. Nor does it live largely on grass. The pig's ancestors—the wild pigs of wood and forest—kept in the shade and away from the sun in the summer, and during the winter they crept into the thickets at night and made themselves warm beds among the litter of leaves and undergrowth. For this reason the farmer has to keep his pigs sheltered most of the year, and he has to give them different food from sheep and cattle. Wild pigs eat fleshy roots and worms, for which they grub about in the soil, together with seeds, nuts, and any small wild animals like rabbits and birds that they happen to get hold of. You see the pig eats both plants and animals, while sheep and cows eat plants only. The farmer has to bear this in mind when he is feeding his pigs, and he tries to give them plenty of barley grain and other foods made of fish and meat. One of their great values to the farmer is that they can use up things that might otherwise be wasted. The small potatoes that are too small for sale usually go to the pigs, so do things like cabbage stalks, and anything left over at the farmer's table. Also the buttermilk and the whey left over on some farms after making butter and cheese are fed to the pigs, and in this way much of what might have been wasted is turned into bacon or pork. You know that at times when stock food is scarce kitchen waste is collected in bins and fed to pigs. You must have seen these bins labelled 'Pig Food' in some of the streets of towns. In this way much food that would be thrown on to the rubbish heap is saved and turned into meat again by the pig. It is, you see, a very useful animal indeed. Nor is it useful to the farmer only. People with no fields for grazing cannot easily keep cattle or sheep, but if they have a small shed they can easily keep a pig, and fatten it on kitchen waste, together with a little meal of some kind. Less than a hundred years ago most country people kept a pig at the back of the cottage, and you will see as you go about the country that there is a pig house specially built in most old cottage gardens. Most of these are empty nowadays, which is a pity. There is nothing better than plenty of good, home-cured bacon for keeping out winter colds—and not many things taste better either. Perhaps you will keep your own pig when you grow up and 'have your own place,' as we say in the country? If ever you do have your own pig —or if you take care to watch the habits of a pig that is properly cared for—you will soon learn that it is a very clean animal. The common belief that pigs are dirty is plain nonsense. They are most tidy. Have a look at the sleeping quarters: the straw bedding (which should be changed every week) is kept very clean indeed, and is rarely fouled with dung or urine. Of course, if the animal is not given a clean and reasonably spacious home to start with, it does get dirty and wretched. But that would be the fault of the owner—not of the pig!

One of the big differences between the babies of the sow and those of cattle and sheep is that they are rather helpless when first they are born. Do you remember the reason? It is because of the sort of life their ancestors lived. The young of wild pigs are born under cover of the forest and undergrowth, so that there is not much danger of attack. For that reason there is no need for them to be kept inside the mother until they can walk so she gives birth to them while they are still tiny and helpless. This also enables her to have more babies at a time as they are so much smaller—and you will notice that sows on the farm usually have quite big litters, and it is not at all rare to see a dozen piglets being suckled by their mother. Sheep and cattle usually have one lamb or calf only. Sometimes there are twins, but never a

How many piglets are there in this litter?

dozen! If you are allowed to examine a litter of young pigs you should avoid disturbing them too much. Like all young things they are attractive little creatures, but sows have been known to eat them after too much interference. There are other reasons for this also, but it is as well not to disturb them too much when they are very young. You may have known of cats or rabbits that ate their young when upset.

POULTRY CAME FROM WILD ANCESTORS

Just as the farmer's horses, cattle, sheep, and pigs have been altered by breeding over a long period of time, so have his fowls. It may seem strange to you that the ancestors of our modern fowls were wild. They did not live in Britain, however, but were found in the East—mostly in Burma and India, and the birds you see on the farm to-day are very different indeed from their distant parents. Not only are they different in appearance; they lay many more eggs every year. You know that birds lay eggs for the same reason that plants grow fruits—to produce young ones—and as a rule they lay only one or two 'clutches' of eggs a year. That was the case with the ancestor of the fowl: it laid about a dozen eggs in the breeding season, and, after hatching out the chicks from these eggs, it laid no more until the following year. But a good modern hen will lay, not a dozen, but perhaps 150 or more in one season; she could not hatch all these even if that was nature's intention! This is another very good example of the way in which farmers can alter wild animals—not by training them, but by breeding methods. Of course, *some* of these eggs are used for hatching out chicks because the laying-birds on a good farm have to be replaced by young birds after a year or two. This is because fowls lay more eggs in the first two years of their lives than they do later on; and the farmer who keeps only young birds gets more eggs from his flock.

There is something very interesting to notice about young birds when they are hatched: not only farm chicks, but the young of other birds as well. Some of them can run about quite easily, and feed themselves as soon as they are hatched. This is true of farm chicks, water-hens, lapwings, partridges, pheasants, and many others. Can you think of some more? You will find that birds that have chicks of this kind always nest on the ground, and because of this they would be in great danger from enemies if they were helpless at birth. So nature comes to their assistance and enables them to move rapidly into hiding if danger threatens in the shape of a stoat or weasel or some other hungry enemy. You will notice too that the eggs of wild birds that build nests on the ground are coloured and marked so that they match their surroundings. This makes them difficult to see, and saves many of them from being stolen by crows or sucked by stoats and so on. Probably the egg of the wild ancestor of the farmyard fowl was a rich brown in colour, and was laid on a nest of brown leaves and grass. Birds that build their nests off the ground or cover them in some way, however, have very colourful eggs that can easily be seen, and their nestlings are quite helpless when just hatched and have to be fed by their parents for many days. They are not so easily attacked up in the bushes or trees, so that nature does not need to give special protection either to the eggs or to the young birds. Can you think of examples of birds like this, and do you know the colours of their eggs? Such birds as the rook or the wood-pigeon or the hedge-sparrow?

Most of the food that is given to poultry has to be bought, but if they are kept in the open they do a good deal of *foraging* for themselves, and farmers often turn their poultry on to the stubble fields after the corn has been cut. Here they are able to make good use of much of the fallen grain, and they find many insects in the soil just as their ancestors did hundreds of years ago.

THINGS TO DO

(1) Write a short paragraph entitled: 'The Cleverest Dog I Know.'

(2) Write single sentences in answer to the following questions:

- (*a*) Why in bygone days were sheep used for milking as well as cows?
- (*b*) For what reason do the hill shepherds sometimes set fire to the heather in autumn?
- (*c*) Why are the high hills used only for sheep farming?
- (*d*) At what time of the year do the hill lambs arrive?
- (*e*) What birds will attack young lambs?
- (*f*) Why do pigs need shelter in both summer and winter?
- (*g*) Can you name a farm food that pigs do not eat?
- (*h*) From what part of the world did the ancestors of the domestic fowl come?
- (*i*) What is the important difference between the hen and her wild ancestor?
- (*j*) Why do some wild birds have chicks that can run about and feed as soon as hatched?

(3) Choose a farmer near to home who keeps pigs, and find out what foods he gives to them. In your book make a list of the things he uses.

(4) If there is a sheep-dog near to where you live find out about it, and write a short paragraph describing its appearance and ways.

(5) Try to find out how your nearest poultry farmer hatches his chickens, and write a paragraph about it.

12

Hay-time and Corn Harvest

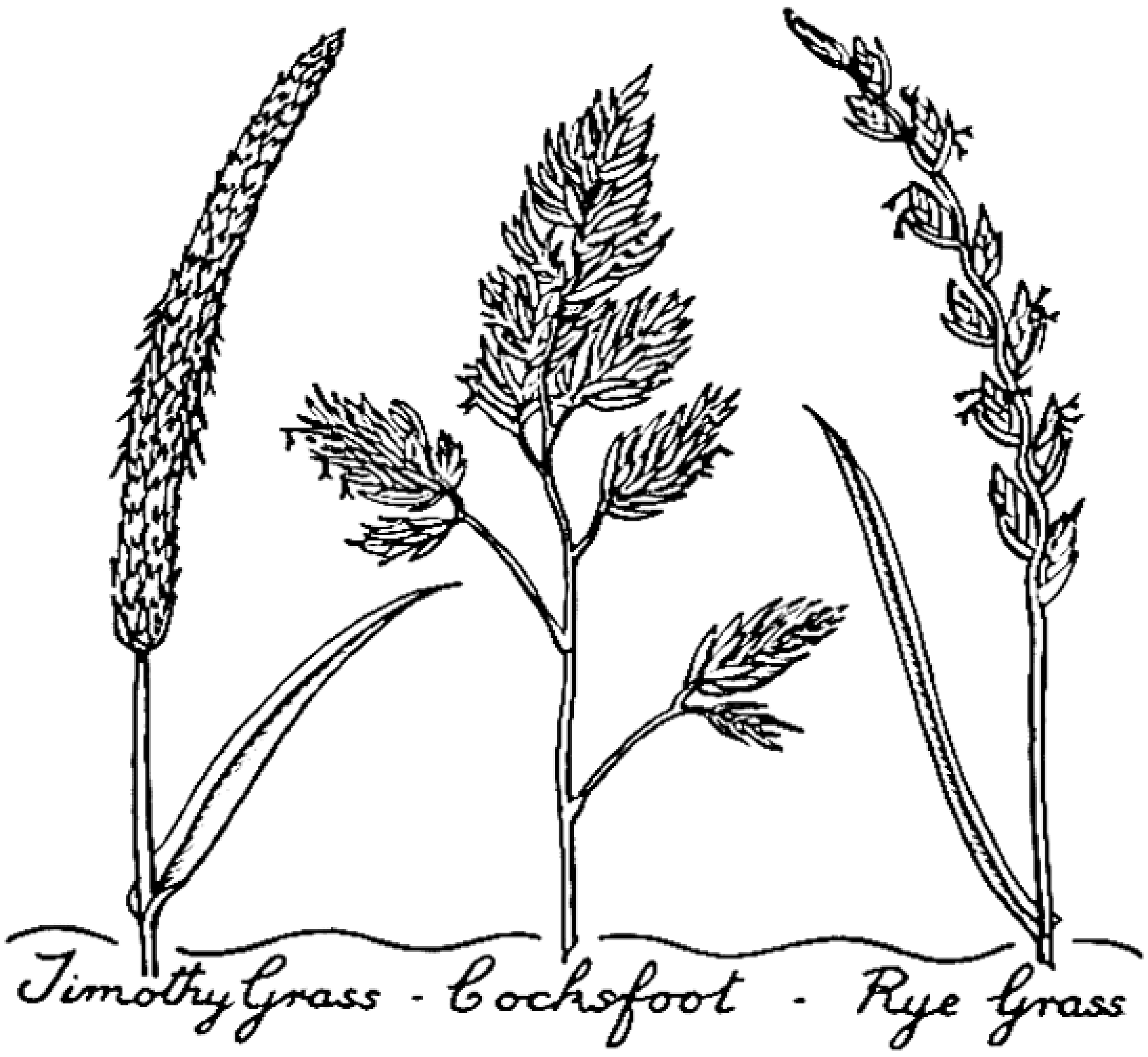
Awed, yet uplifted by the silence and clean-washed loveliness of the dawn, the children would pass along the narrow field paths with rustling wheat on each side. Or Laura would make little dashes into the corn for poppies, or pull trails of the lesser bindweed with its pink-striped trumpets, like clean cotton frocks, to trim her hat and girdle her waist, while Edmund would stump on, red-faced with indignation at her carelessness in making trails in the standing corn.

FLORA THOMPSON in *Lark Rise to Candleford.*

THE HAY HARVEST

AT THE beginning of the summer the farmer is already harvesting the crops that will be used for feeding his livestock in the following winter; and, except in the wetter districts, the hay harvest begins. The hay is the first crop to be stored, and —although things like lucerne or even mixtures of peas and oats may be cut as hay—grass and clover are the fodders which we usually have in mind when we speak of hay crops. Sometimes the farmer sows mixtures of grass and clover seeds on his ploughland. Hay that comes from these fields is called 'seeds hay,' and is usually the best kind. Sometimes, a permanent-grass field is 'shut up' in the spring—that means that cattle and sheep are not allowed to graze it—and the grass is left to grow. Hay that comes from fields of this kind is called 'meadow hay.' There is usually not such a heavy crop of this grass, and sometimes it makes very poor hay indeed; but on some farms the meadow hay is the sweetest of all, and is evidently enjoyed by the cattle. This is perhaps because there are some tasty herbs like *plantain* in the mixture.

When the grass is growing, or just after it has been cut, it contains a great deal of water. You remember all the water that comes in through the roots? Indeed more than three-quarters of the weight of freshly cut grass is due to the water it contains. The newly mown grass cannot be called hay or put into a stack until most of this water has been removed by drying. A stack made of juicy grass, or grass that may even be called damp, would be useless for feeding to cattle because it would not keep. The grass would rot and decay or become foul in some way. These undesirable changes are caused, like the souring of milk, by


Timothy Grass - Cocksfoot - Rye Grass

These three grasses are commonly grown on British grassland.

certain germs or *bacteria*, as they are called. When these bacteria get to work the grass is spoiled, and sometimes a damp stack will get so hot because of the heat produced by these bacteria that it will set itself on fire. These tiny creatures cannot thrive, however, when the grass has lost most of its moisture. After cutting his grass, therefore, the farmer has to let the sun and wind get to it so that it will dry out. This drying process is called haymaking.

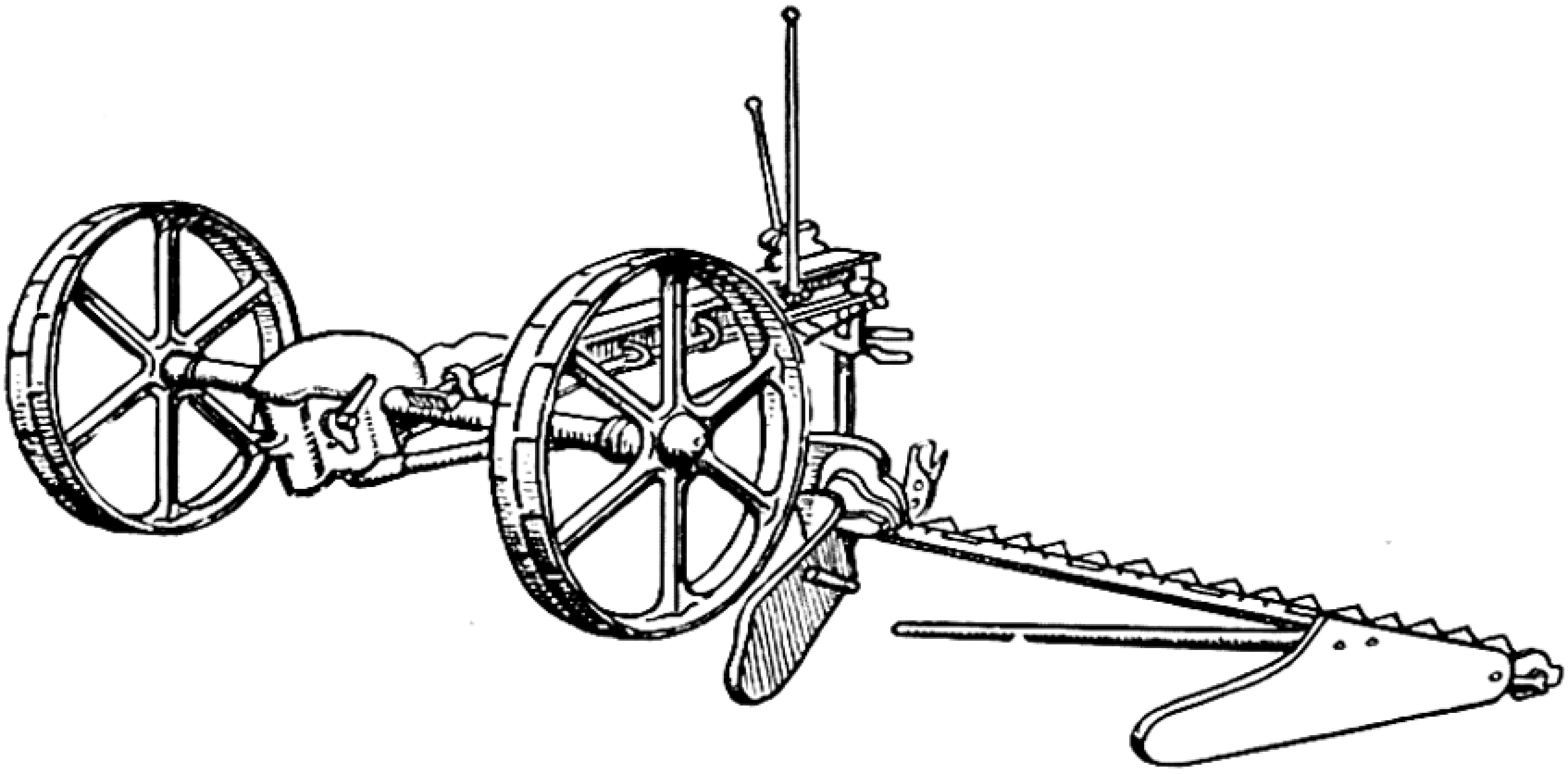
Freshly mown grass needs drying before it can be stacked.

Let us follow the farmer as he takes his horses and mowing-machine on to the field. Less than a hundred years ago, of course, all the hay was cut with a scythe, and on some hilly fields even to-day a scythe is the only implement that can be used. Further back still the sickle was used, and that must have been hard work indeed. If you examine the mowing-machine you will see that it has a cutting bar which does the actual mowing. This bar contains a long sharp knife with zigzag blades, and when the machine travels across the field this knife moves from side to side very rapidly, and cuts the grass down. The same sort of thing happens on your head when you go to the barber's for a haircut! The clippers that the barber uses work on a similar principle. As the grass is cut it is gathered into rows called swaths, so that it will be out of the way of the machine when it comes round the field again. If these swaths were not

In former days all our hay and corn was cut with a scythe.

made the machine would travel over the mown herbage and damage it. There is a special attachment for making these swaths—at the end of the cutter bar is a long *swath-board*, and as the cut grass falls down this board rolls it into rows.

Once the grass has been cut the process of haymaking begins. Sometimes the farmer spreads the grass all over the field with a machine called a *tedder*, or he may be satisfied just to turn the swaths over—after they have dried on top—with a *swath-turner*. In hot dry weather the grass is soon made into hay, and can be carted off in a day or two for stacking, but it usually takes longer, and if there is any risk of rain the farmer gathers the drying grass into little heaps called haycocks, so that even if it does rain most of the grass is kept dry. As soon as these cocks are dry enough they are carted to the stacks which are sometimes made in the field and sometimes in the stackyard. If they are made in the open they have to be properly thatched like an old-fashioned cottage.



Why is there no seat on this modern mowing-machine?

The thatched roof keeps out rain, hail, and snow until the hay has all been used up. Nowadays there are farmers who cut some of their grass while it is still very young and full of sap. They do not let this juicy material dry in the field: instead they cart it to a machine called a *grass drier* in which it is dried artificially—much in the same way that your mother dries herbs in the oven. When the dry grass comes out of this machine it is ground to a powder and stored in sacks. This is a very good stock food indeed; but, of course, cattle need hay or straw as well. Remember that in order to chew the cud, cows (and sheep) need roughage of some kind, and either hay or straw is necessary to them in the winter for this reason.

After the hay has been taken off, the grass soon begins growing again. The second crop is called the *aftermath*, and it may be cut as a second crop of hay some weeks later, or it may be grazed by cattle and sheep. You will quite easily understand that the farmer depends very much on the weather for his hay crop. In mixed weather the tractor is very useful as it enables the work to be done very quickly, and the farmer can take great advantage of the shortest dry spells. If you ever go to places where there is a good deal of rainfall such as Ireland or Scotland or Norway, you will often find the farmer using special methods for drying his grass. In Norway the newly mown grass is often hung up to dry on long, tall fences in much the same way that the laundry is hung out on washing-day. Haymaking is very much easier in the drier parts of England than it is in the wetter parts.

THE CORN HARVEST

Perhaps the most thrilling and important time on the farm fields is the time of the corn harvest. This begins in most places in July and may go on until late August. Oats are cut first, then wheat, then barley. Until the beginning of this century most of the corn was not safely stacked until September, but the kinds of corn that the farmer grows nowadays are ready for cutting much sooner and, of course, the more speedy machinery makes the job a lot quicker. You may have heard people talk of the moon that comes up in September as the 'harvest moon.' Can you work out the reason for this name? In the days of your great-grandfather, when the corn was still in the fields in September, and before the days of tractors, great gangs of men had to be employed for the harvest, and in order to get the job done at all it was necessary for them to work from early morning until late at night on many days. Indeed much of the work had to be done in the moonlight, and so the September moon was called the harvest moon. Nowadays the September moon shines its silvery light on to fields of bare stubble. Changes in farming, you see, are still going on. When the last load—in those bygone days—had been carted in, the big farmers always gave a feast to the parish. Most of the people in the parish helped at harvest so that there were few who did not get an invitation to the harvest home as the feast was called. Here is a description of such a feast written by a woman who remembered the scene:

> On the morning of the harvest home dinner everybody prepared . . . for a tremendous feast, some to the extent of going without

> breakfast. . . . And what a feast it was! . . . such a boiling of hams and roasting of sirloins, such a stacking of plum puddings, such a tapping of eighteen-gallon casks and baking of plum loaves would astonish those accustomed to the appetites of to-day. . . . Long tables were laid out of doors in the shade of a barn, and soon after twelve o'clock the cottagers sat down to the good cheer, with the farmer carving at the principal table, his wife with her tea urn at the other, the daughters of the house and their friends circling the tables with vegetable dishes and beer jugs, and the grandchildren, in their stiff, white, embroidered frocks, dashing hither and thither to see that everybody had what they required. As a background there was the rickyard with its new yellow stacks and, over all, the mellow sunshine of late summer.[1]

There were sports and games after the dinner, and the feast was enjoyed by all. Perhaps the men did not get much money for their labours in those days, indeed they were poorly paid, but they had the virtue of working hard and enjoying their work. They were alive, and put their hearts into their labours. You get a lot of happiness out of a job when you do that. Let us have a look now at the modern scene.

Corn[2] is a taller plant than grass, and can be bound up into bundles called sheaves which are easy to handle. It would be very difficult to move a lot of loose straw about with a rake or a pitchfork. That is why the farmer prefers to have his corn in the sheaf. In former days this bundling up of the crop had to be done by hand, but nowadays a very remarkable implement called a *binder* is used. This machine has a cutter bar similar to that on a grass mower, but the cut corn falls on to a platform behind the cutter and not on to the ground. The rotating *reel* or 'sail' helps to lay the cut corn on to a moving sheet of canvas, which carries it into the compartment (called the *deck*) where the sheaf is made up. Here it is packed together until there is enough for a sheaf when out comes a large needle threaded with thick twine. The twine is wrapped round the sheaf, a knot is tied, and the string is cut off—all quite automatically. The tied sheaf is then thrown out on to the field. As you walk behind the binder you will see that a sheaf is thrown out every few yards.

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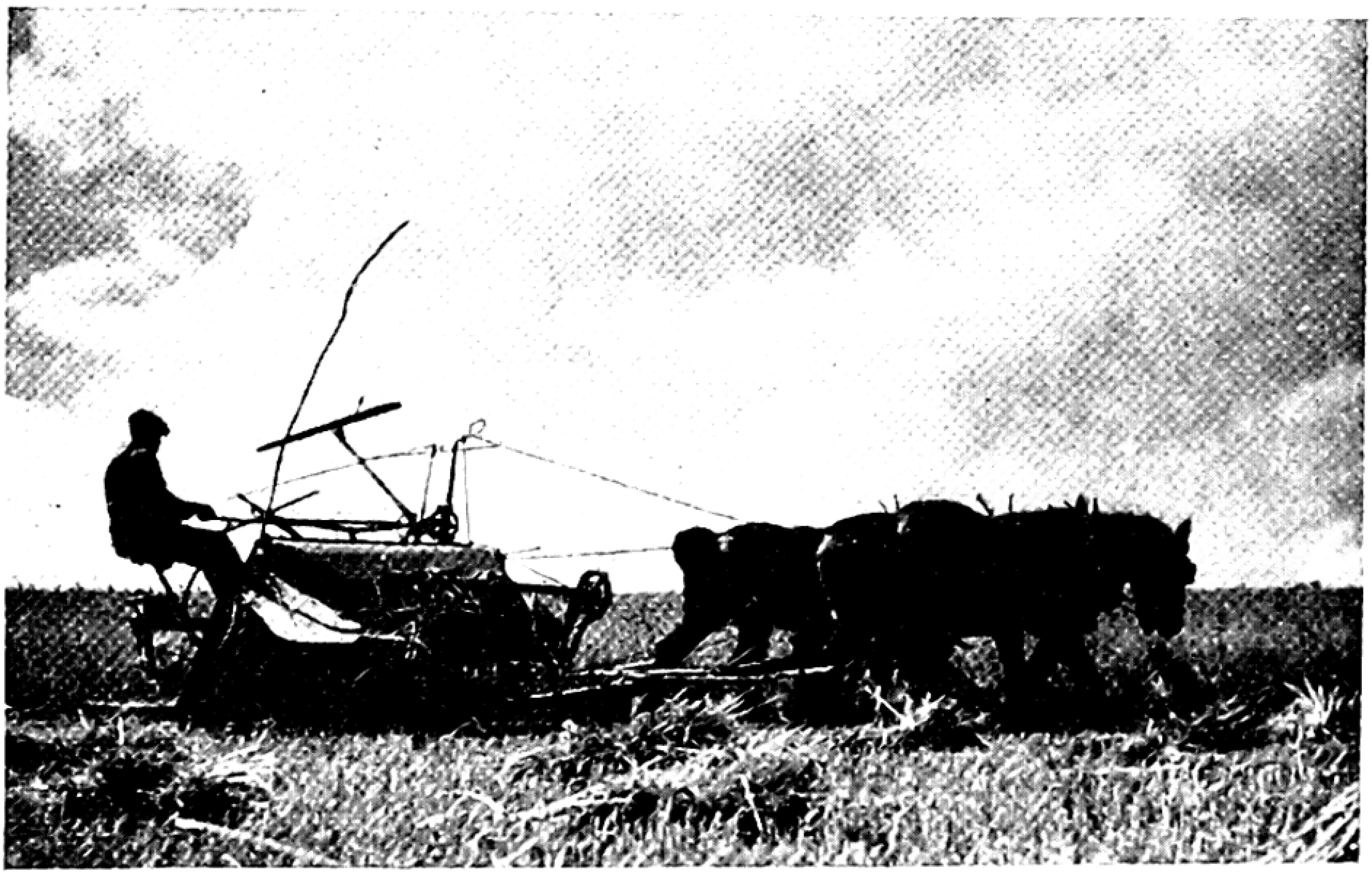
[1] From *Lark Rise to Candleford* by Flora Thompson (Oxford University Press).

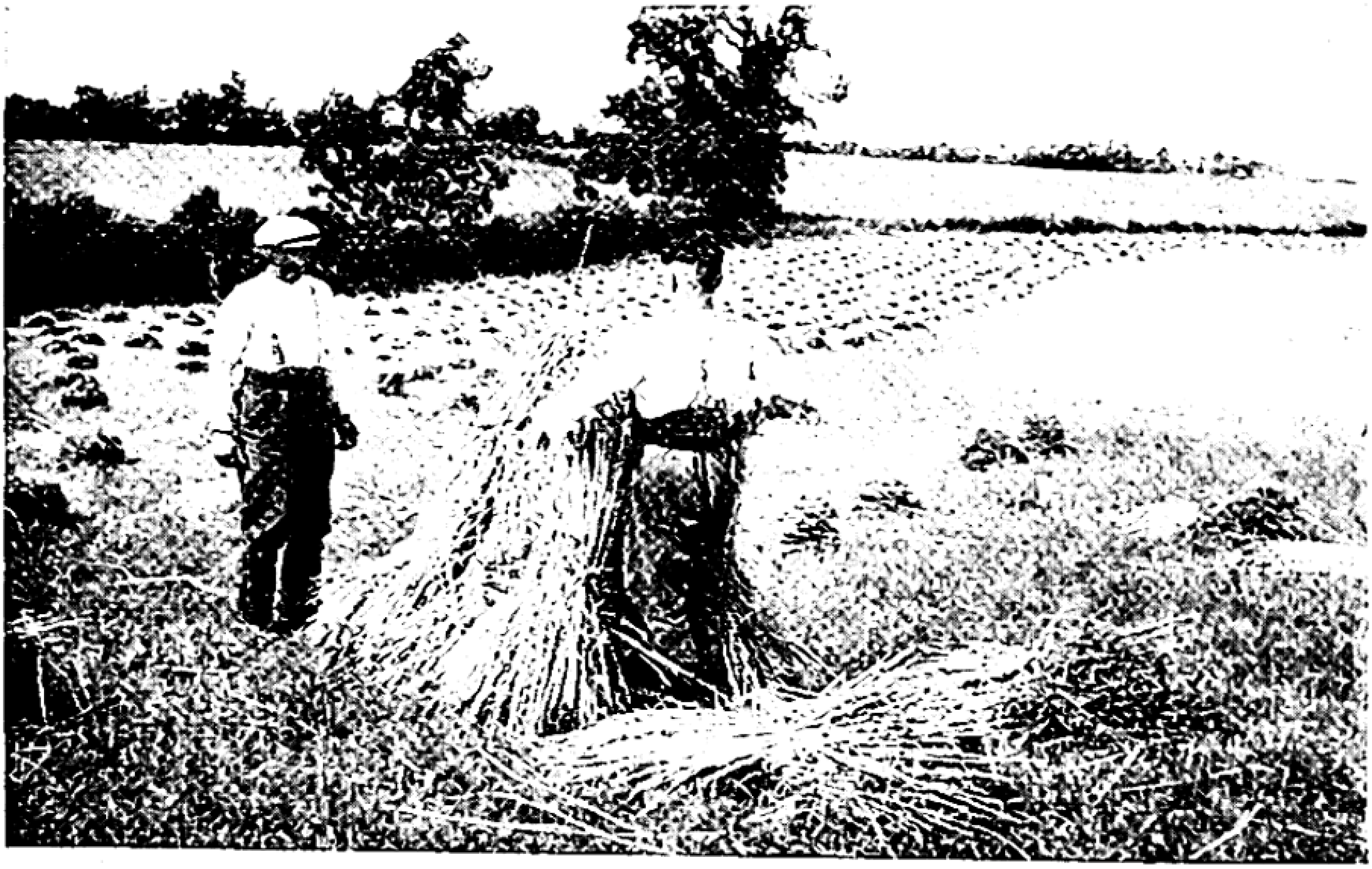
[2] When we speak of corn in Britain we mean oats or wheat or barley or rye. The cornflakes that some of you have for your breakfast are not, however, made from any of these things. In America the word 'corn' means maize and your breakfast cornflakes are made from the American maize.



As the binder goes along it cuts the corn and binds it into sheaves.

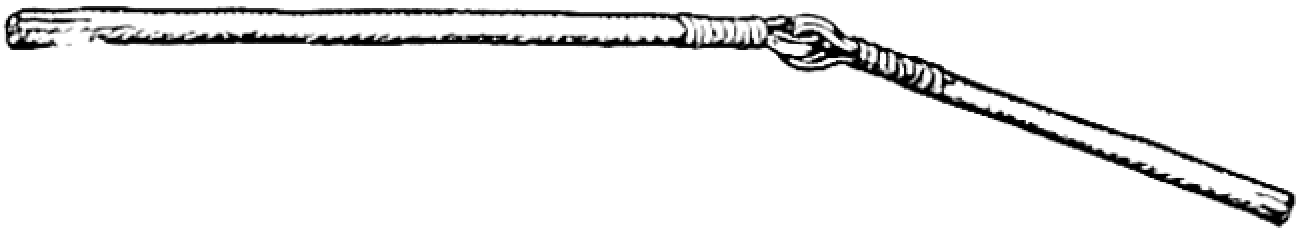
As soon as possible the sheaves are collected together into stooks (shocks, or quivers) just as the hay was put into cocks. These enable the sun and wind to dry the straw, and they are made in the shape of a roof so that if rain comes the water will run off easily.

Sheaves left lying on the ground would soon become soaked in bad weather. Another reason for leaving the corn in stooks is so that the grain will ripen. As a rule wheat and oats need to be left in the field for at least a week before the grain is 'dead ripe,' as the farmer says. Barley does not need so long because it has to be quite ripe when it is cut, and in very fine weather it can be stacked after two days. No doubt you have helped to do some stooking on the farm. Wheat and oats are pleasant crops to handle, but the barley 'needles' scratch your arms badly as they are very sharp. This is one reason why barley straw is rarely fed to cattle.



Why it is necessary to stook the sheaves in this manner?

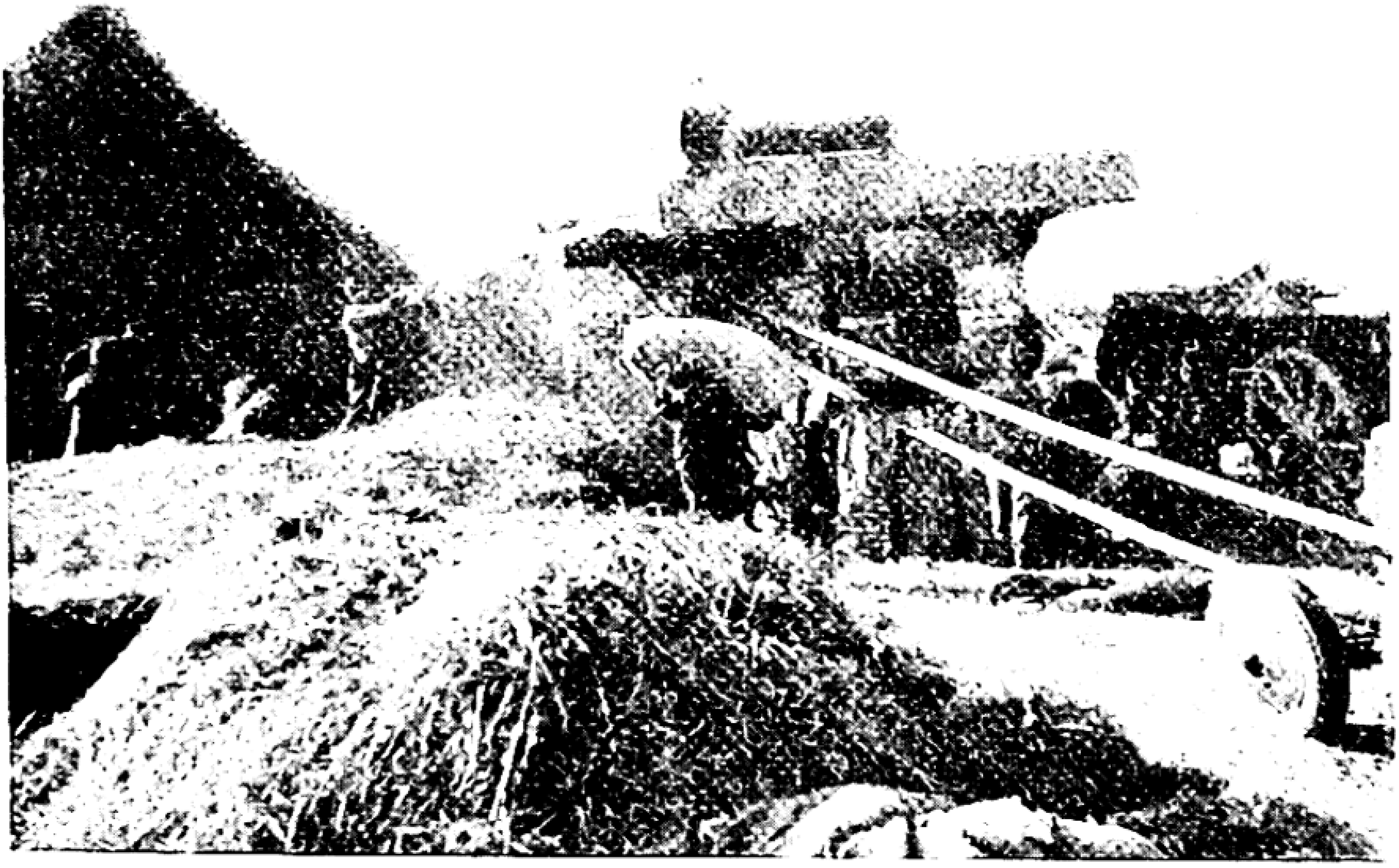
If the grain is quite ripe the corn can be *threshed* right away. In the old days the threshing was done by men who used a weighted whip called a *flail*, such as you see in the drawing on this page. On a big farm it would take a number of men most of the winter to complete the job which was done on the big threshing floors of the large barns they built in former days. The corn was laid on the floor and beaten with the flail.



A flail.

This knocked the grain out of the ears, after which the straw was picked up and the grain gathered from the floor. If you take a look at one of these old threshing barns you will probably see that it has a large doorway on each side of the threshing floor. Can you guess the reason for this? You know that when corn is threshed a good deal of papery chaff comes off with the grain. This had to be separated, and when both the doors were open the slightest breeze created a draught, and the chaff was blown away from the heavier grain.

Nowadays the threshing is usually done by a large machine called a *thresher*. The owner travels round from farm to farm and is paid by the farmer for doing the job. Not many farmers have their own threshers as they are very expensive, and if used by one farmer alone they would be lying idle most of the year. This rather wonderful machine rests on four wheels and looks rather like a van. The works inside it are driven, as a rule, by a tractor engine to which a long driving-belt is attached. You can always tell when it is at work, even when you cannot see it, because it gives out a musical hum that can be heard quite a distance away. The straw—which comes out in bundles called battens—is delivered at one end of the thresher, and the grain is run into sacks at the other. The machine is so thorough that any broken grain



Here is a threshing machine at work. Can you say what each man is doing?

(called tail-corn) is separated and comes out at a different place. The grain is removed for storage, and the straw is built into a stack. It will be used later for bedding the livestock or for feeding them. Usually only wheat and oat straw are used for food, oat straw being the best. In this way a good deal of the straw goes back on to the land as farmyard manure. Do you remember the importance of putting organic material into the soil?

THINGS TO DO

(1) Write a short paragraph entitled:

- (*a*) 'At Work in the Hay,' or
- (*b*) 'Bringing Home the Hay,' or
- (*c*) 'Cutting the Corn.'

(2) Write single sentences in answer to the following questions:

- (*a*) What is the main difference between grass and hay?
- (*b*) What is meadow hay?
- (*c*) About what fraction of the weight of fresh grass is due to water in the leaves and stems?
- (*d*) What do we call the grass that grows after the hay has been carted off the field?
- (*e*) Why did our forefathers call the September moon the 'harvest moon'?

(3) *Experiment.* Weigh a quarter of a pound of fresh grass that has no rain on its leaves. It is best to chop it up first into pieces about one or two inches long. Now spread it out on a newspaper and put it on the top shelf of the oven and leave it until it is quite dry. It will be curly and brittle, but *not burnt.* You must look at it from time to time to prevent it from burning at all. Now weigh it again. You will find it weighs very much less than it did at first. Can you think why this is? Most of the water has been 'dried out' of the grass. We say it has *evaporated.* Try to work out roughly what fraction of the weight of the fresh grass is due to the water in it.

Example: Weight of the fresh grass =4 oz.
Weight of the dry grass =1 oz.
Weight of water in fresh grass =3 oz.
Fraction of fresh grass due to water $=\frac{3}{4}$.

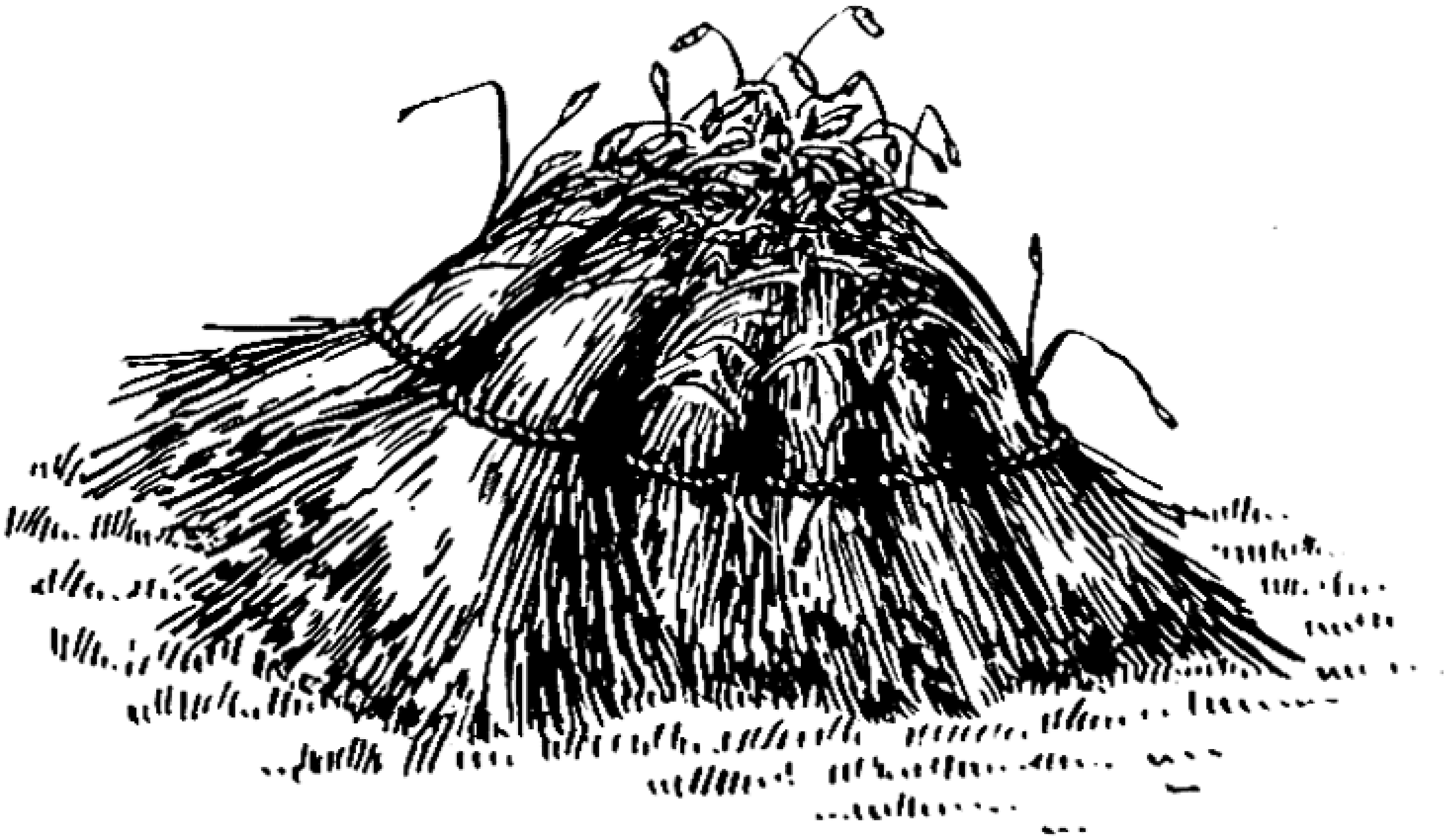
Write a clear account of what you did in your book.

(4) When the corn is ripe ask your farmer friend to let you have a complete plant. This will have on it several stems each with an ear of corn at the top—and all

coming from one set of roots. Remember that it all grew from one grain. Now carefully get out all the grains and count them. How many are there? In this way you will be able to see how the crop has multiplied. Write down what you did in a short, clear paragraph.

(5) Collect as many different weeds as you can from the cornfields (take care not to step into the standing crop), and bring them to school. The whole class should find at least twenty different ones. They should be neatly labelled and put on the Nature Table. Write a list of their names in your book under the title 'Weeds of the Corn Fields near our School.'

(6) Do the same thing with weeds of the hay fields.



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